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AMERICAN ANTIQUITY

VOL. VIII APRIL, 1943 NO. 4

ARTIFACTS FROM ANCIENT WORKSHOP SITES NEAR TADOUSSAC, SAGUENAY COUNTY, QUEBEC*

W. J. WINTEMBERG

IN 1915, while making ethnological investigations among survivors of the Tadoussac band of the Montagnais Indians at Tadoussac, Quebec, Dr. Frank G. Speck, of the Department of Anthropology, University of Pennsylvania,[1] learned from the Indians that stone implements had been found on a sandy hill north of the village. From the surface of the site he collected about three hundred chips and stone artifacts which are now in the National Museum of Canada. Another lot of about two hundred and fifty specimens collected by him are in the American Museum of Natural History, New York. In 1927, this and other sites were investigated by the author,[2] who made a careful search of the exposed surface of the area between Tadoussac and Moulin Baude River, about three miles to the east and gathered about one thousand instructive specimens besides several hundred chippings.[3] In addition to the surface searching, several trenches were dug into what seemed to be the least disturbed parts of the sites near Tadoussac and several other specimens were found in situ.

The specimens secured by Dr. Speck lack specific data, but most of them probably were picked up on the second and third terraces north of Tadousssac.

The following study of the archaeological material recovered from the sites is based partly on the material secured by the writer, partly on that collected by Dr. Speck.[4]

* Editor's note: This paper, the appearance of which has been long awaited by those interested in the archaeology of northeastern North America, was found in Mr. Wintemberg's files after his death. It was forwarded to the Editor by Dr. Jenness in June, 1941.

[1] See Speck, 1916. Bibliography see pp. 361–362 following.

[2] See Wintemberg, 1929.

[3] Several additional specimens were collected in 1939.

[4] The author's grateful acknowledgments are here extended to Dr. Eugene Poitevin for identifying the rocks and minerals, to Mr. Aimé Lapointe for permission to excavate on his property, and to Dr. N. C. Nelson, Curator, Department of Anthropology, American Museum of Natural History for information and drawings of gouges in the Speck collection in that museum.

THE SITES

Speck refers to three terraces on which he found archaeological material:[5] the first, where the Tadoussac Hotel stands, yielding relics of the historic period; the second, beyond Tadoussac Creek, north of the village; and the third, the highest, north of and parallel with the second. The writer has adopted two of Speck's designations, but adds a terrace between Speck's second and third, and calls Speck's third terrace the fourth terrace. The fourth terrace[6] is about fifty-eight feet higher than the third, and the third terrace is about thirty-six feet higher than the second, but originally may have sloped down to the same level as the latter.

The most extensive wind-eroded area on which workshop debris and artifacts were found, is on property owned by Aimé Lapointe, north of Tadoussac. The eroded area on the second terrace extends about 1700 feet east and west and about 500 feet north and south. Parts of this terrace have been protected from erosion by small clumps of spruce and cedar, but even here there is evidence of some former shifting of the sand. The original, intact part of the north end of this terrace is confined to a narrow strip along the foot of the steep slope below the fourth terrace. The scarped face of the bank is steep, and the top is from about two to ten feet above the level of the denuded surface of the terrace. Most of the exposed part of the third terrace, a roughly triangular area about 275 feet long and 212 feet wide, is also on the Lapointe property. Its undisturbed portion is triangular, as long as the eroded part, and about 100 feet wide at the fence which runs north and south at the west end. A smaller, partly denuded area, about two acres in extent, traversed by the road running north of Tadoussac, lies to the west of the fence, on property belonging to Alphonse Marquis. A high, more or less flat-topped, sandy hill, separated from the road by a small creek, lies to the north; its top is partly eroded, exposing a workshop site. There is also a denuded area west of the village, north of the road which runs to the steamship dock on the Saguenay, but very few specimens were found here. Another eroded area yielding artifacts and chips lies east of Tadoussac Bay, beyond Dwight Park, on property owned by Madame G. de Guerry Languedoc. Beyond this, from one to two miles further east, is an extensive, denuded, desert-like expanse, extending to Moulin Baude River. In this area, about a mile long east and west

[5] Speck, 1916, p. 429.

[6] Several shore lines were seen at Tadoussac. The highest, which is a very good one, being 405 feet above mean tide. Another lies below it at 180 feet. To the east of the village, the higher one extends along the St. Lawrence for three miles or more, and is one or two miles wide.

and less than a mile north and south, are two terraces: the first, immediately above the St. Lawrence, the other, about as high as the top of the fourth terrace north of Tadoussac.

The surfaces of all these terraces were covered with thousands of chippings and unfinished and finished artifacts. A few chippings were also found on the golf links at the east end of the village, north of the road, and a few others on the fourth terrace on the Lapointe property.

Several trenches were dug into what appeared to be the least disturbed parts of the second and third terraces, north of the village. Trench No. 1, on the second terrace, about seventy-five feet long, east and west, and twelve feet north and south, and about 148 feet south of the foot of the hill of the fourth terrace, revealed a stratified deposit consisting of a layer of greyish sand, about thirty inches deep, which seems to have drifted over the implement-bearing layer, two to four inches deep, made up of whitish sand containing small scattered patches and streaks of what looked like charcoal. Below this, the sand was loose and discolored to a depth in places of about ten inches. This loose sand rested upon the undisturbed stratified greyish sand. A few chippings were found in the thin layer, but most of the chips and a few artifacts were found in the discolored sand below. Trench No. 2, on the same terrace, was thirty-two by ten feet in extent, and was 160 feet west of Trench 1. Here, also, the sand was stratified but the implement-bearing deposit was not as deep as in Trench 1. In one spot there was a pocket of loose discolored sand two feet deep. Trench No. 3, in the intact part at the foot of the steep bank below the fourth terrace, was 265 feet west of Trench 2. It was fifteen feet long and five feet wide, with its longer diameter east and west and parallel with the scarped edge of the terrace. The half burnt and partly decayed pieces of wood encountered in Trenches 1 and 2, below the thirty-inch layer of drift sand, suggest that the implement-bearing layer had been covered by sand washed from the slope south of the fourth terrace, or by sand drifted here by offshore winds, at probably no very remote period, perhaps as recently as the period of white settlement at Tadoussac.

Two trenches were dug into the third terrace, one of them (No. 1), thirty-seven by five feet, and about eight feet deep, with its longest diameter northeast and southwest, and the other (No. 2), twenty-five by fifteen feet, 116 feet west of Trench 1, and about thirty feet east of the fence running north and south between the Gauthier and Lapointe properties. The excavations in Trench 2 showed that the material used in the manufacture of artifacts did not occur in gravel beds in situ, but was brought here and worked. A deep excavation, at least twelve feet deep from the top of the intact part of the terrace, did not reveal a

gravel or cobblestone layer; there was nothing but stratified sand, laid down by water, for about eight feet. Above this was a layer of yellow mould, from 18 to 20 inches deep, with reddish streaks and an occasional patch of ashes and charcoal. On top of this was a layer of yellowish grey sand about thirty inches deep. A few chips and artifacts were found in the top of the yellow mould layer, but none deeper than six inches. The layer of yellowish grey sand at the top of the bank appears to have been washed down from the sides of the fourth terrace, immediately north of it. The appearance of the top of the yellow mould layer, in which the chippings and artifacts were found, suggests that there had been a certain amount of sand shift going on when the terrace was used as a workshop, and it is probable that the surface of this terrace, and perhaps that of others also, presented the same denuded appearance then that it does today. The sites are said not to have changed within the memory of the oldest Montagnais Indian.

There was no blackened soil present, as at most sites occupied for any length of time. Such ashes and charcoal as were observed near the surface may have been caused by recent fires, which had been covered by the constantly shifting sand; but those deep down in the relic-bearing layer were undoubtedly old and probably contemporary with the implements. Whitened seal bones, mostly scattered in Trenches 1 and 2, look as if they had been burned, and suggest that the workers occasionally had camped here; others found on the surface, however, may have been left quite recently. No fire-marked stones were seen in the excavations or on the surface.

Speck considers the artifacts other than chipped as very old, judging from their worn appearance. This appearance of age in some cases, however, may be partly attributable to attrition by the almost constantly shifting sand rather than to age.[7] On the other hand, some artifacts of hard rock that show evidence of disintegration suggest the extreme age of the sites. If patination can be considered an indication of antiquity, then this site is probably old, because a few of the roughly chipped specimens are weathered to a light grey, whereas the color of the material itself is dark grey; the patination or weathering in one case extends to a depth of about $\frac{1}{8}$".

[7] In most cases, the pecked surfaces of the unfinished adzes seem to have offered less resistance to the wearing action of the sand than the polished surfaces of artifacts of the same class; the exposed surfaces of only a few polished stone adzes show extensive erosion, the sides not exposed to the drifting sand retaining their smooth polish. Pieces of broken glass found on the surface of the sites are sand-eroded, the glossy surfaces being dulled and the broken edges rounded. The naturally shiny surfaces of the quartz crystals were similarly dulled by sand erosion.

The artifacts from the three highest terraces north of the village, those from the east side of Tadoussac Bay, and those from the two terraces near Moulin Baude River, all probably belong to one period. It is possible that the sites were inhabited long before the arrival of a pottery-using Woodland people in this part of the St. Lawrence Valley.

THE ARTIFACTS

The artifacts recovered from these workshop sites consist of those chipped from stone, those of rough stone, and those that were pecked, ground, and polished; the majority of the specimens were of the first class. No pottery or bone artifacts were found.[8]

Artifacts Chipped from Stone

The artifacts chipped from stone consist of points or blades of various shapes and sizes, used either as knives or spearheads, a small notched point for an arrow, a scraper blade, a few chisel-like objects, and a few crude objects of unknown use.

The materials from which the artifacts are chipped are quartz, quartz crystal, chert, what seems to be a cherty limestone, slate, and sandstone. Besides the finished artifacts chipped from those materials, there were several thousand chippings and worked masses scattered almost everywhere over the exposed surfaces of the sites, in some cases with the hammerstones, presumably used in breaking them, lying in their midst. Most of the raw materials, some of which were not used in other parts of the St. Lawrence Valley east and west of Saguenay River, seem to have been brought here to be worked. The bulk of the manufactured products are confined to three or four materials.

Most of the chippings and the blades are of quartz of several different varieties, including white, bluish, rose, translucent, and variegated. The workers were not particular in their choice of this raw material, as some of the blades were worked from thin lamellae of variegated quartz, which in some cases is like gneiss in appearance and seems unsuitable for use. A few of the artifacts and many of the chippings are of translucent quartz.[9] The chipped surfaces of points of this material

[8] Eleven pottery fragments, now in the American Museum of Natural History, New York, were found by Speck in a refuse deposit near a camp about 300 yards from the mouth of the Moulin Baude on the St. Lawrence. Six of the pieces show a surface finish like that on Iroquoian pottery; the rest bear cord-impressed decoration like that on Woodland pottery. A bone awl or arrow point was found in the same deposit.

[9] The writer has found chippings and artifacts of this material along the north shore of the Gulf of St. Lawrence and the northwest coast of Newfoundland, so it must occur in situ somewhere in the Labrador peninsula. None has been found in the form of pebbles or boulders.

present a granular appearance and look more like quartzite than quartz. The most abundant variety of quartz is whitish and in some cases, owing to the surfaces being dulled by sand erosion, looks almost like chalcedony. There are many chippings, a single lamellar flake, and several worked masses of this material, beside 200 points chipped from it.

Only four of the artifacts are of quartz crystal, viz., an unfinished point for a knife (Cat. No. VIII-E-801), a small arrow point about $\frac{3}{4}''$ long, collected by Speck,[10] and two crude scrapers; but from it also were several hundred chippings and partly worked crystals, the latter 1″ to 2″ in diameter. Some of these chips are razor-edged and could have been used as knives either directly or set in handles; three indeed, have one edge nicked from use (Cat. Nos. VIII-E-557 *b*, *g*, and VIII-E-685*m*). Similar crystals are said to occur naturally in the ground a few miles east of Tadoussac.

There were fewer chippings, small worked masses, and artifacts of quartzite than there were of quartz. Four large masses were found from which large pieces had been broken; one was in Trench 1 on the second terrace. The color varies from creamy white to dark grey, the latter banded in a few cases; a few other pieces are light brown, maroon, or bluish. Some of the chippings retain part of a waterworn surface, indicating their derivation from pebbles and cobbles such as could be seen imbedded in the talus at the foot of the steep slope south of the fourth terrace. Some of the quartzite is quite granular in appearance. Although it does not always chip in a way to produce sharp edges, some of the points made from it are quite sharp and delicately chipped.

Chert, which is abundant at most sites elsewhere in eastern Canada, was here represented by only about sixty chippings and thirty-two artifacts. Some pieces look like fragments of prepared cores from which crude lamellar flakes had been struck (especially Cat. No. VIII-E-553*m*) but no flakes were found. It is light, dark, greenish, bluish grey, purple, and black, but most of it is grey.

Over 300 chips and masses of red, plain grey or veined grey slate were found, and there are twenty-four artifacts made of grey slate.

There are six large blades, about 200 chips, and several small worked masses of a material resembling sandstone. This rock does not seem suitable for manufacture into blades, because it is quite soft and exceedingly light in weight. Possibly it was much harder when first chipped, and long burial in the ground reduced it to its present condition. If it was originally soft, it is rather surprising for there was no

[10] Speck, 1916, p. 431.

lack of suitably hard, workable stone. A similar material, of which there are about 200 chips and blades, is much harder.

Points for Arrows, Spears and Knives. The most common artifacts are blades or points for spears and knives, of which 158 were found by the writer, and eighty-seven by Dr. Speck. Besides these whole or nearly whole specimens, there are about 250 fragments, a few of which were collected by Dr Speck

The blades vary from $1\frac{3}{4}''$ to $7''$ in length, from $\frac{7}{8}''$ to $4''$ in width, and from $\frac{3}{16}''$ to $1\frac{1}{2}''$ in thickness. The majority are lenticular in cross-section, and the longitudinal section of the more evenly chipped specimens is also lenticular; others are plano-convex; a few are somewhat triangular; two are rhomboidal; and one is concavo-convex. A few are plano-convex in cross-section at one end and lenticular at the other.

In many cases, the edges of the blades are neatly and regularly chipped. The thicker and cruder specimens may have been rejected because they were too thick. Some may be incipient forms intended for further specialization elsewhere.

The blades may be roughly divided into eight different classes, according to shape, viz.: leaf-shaped, lozenge-shaped, triangular, unilaterally curved, quadrangular, irregular, stemmed, and notched. Some of these classes are further divisible.

Leaf-shaped blades are most common and include the following sub-classes: (1) those with both ends rounded; (2) those with both ends pointed; and (3) those with only one end pointed. Each sub-class, in turn, included several different kinds or types.

Blades of the first sub-class, of which there are twenty-one specimens are of six different kinds: four bilaterally symmetrical; six broader at one end than at the other (Pl. XXV, A, *4*); two with straight edges sloping to one end; two with more or less parallel straight edges (Pl. XXV D, *2*); five, broad, and in some cases irregularly oval (Pl. XXV, A, *1*); and one that is somewhat obovate. Blades of the second sub-class, of which there are sixty-eight specimens, are mostly from about two to four times longer than wide, and of four different kinds: fourteen almost symmetrically lenticular in outline (Pl. XXV, B, *11*); sixteen similar but broader and almost oval in outline (Pl. XXV, A, *2*); twenty-five taper more to the tip than to the base (Pl. XXV, B, *12*); and three taper more to the base than to the tip (Pl. XXV, B, *10*). Ten others are more curved on one edge than on the other (Pl. XXV, C, *5–7*, *9*, and *10*), but in most cases probably were not so made intentionally. The process of development of the double-pointed blades seems to have been completed. Blades of the third sub-class, of which thirty-eight specimens were found, are of six different kinds: twenty with convex bases and sides

(Pl. XXV, A, *5* and *7*); eleven with straight base and convex sides (Pl. XXV, A, *3*), a few of them asymmetric; one with the base formed by converging straight edges (Pl. XXV, B, *6*; two with the sides slightly incurved near the tip (Pl. XXV, A, *9*), and Cat. No. VIII-E-670*d*, the latter crudely chipped from quartz); two with oblique base and convex margins (Pl. XXV, C, *12*); and two with the tip formed by abruptly converging straight edges (Pl. XXV, A, *6*).

Leaf-shaped blades like some of those described above have been found in other parts of Quebec[11] and in Ontario.[12] A few years ago twenty-four blades, some of which are of the same type as some of those described, were discovered by Dr. George F. Clark of Woodstock, near Bristol, Carleton County, New Brunswick.[13] These were probably left by people of the same culture as those at Tadoussac.

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[11] There is a blade of the same shape and of similar material as that in Pl. XXV, A, *3*, from Lake Assinitchibastat, Chibougamou River, Abitibi District, Quebec, in the National Museum of Canada (Cat. No. VIII-E-1).

[12] See Wintemberg, 1931, Pl. IV, Fig. 14, showing one like that in Pl. XXV, A, *5*.

[13] Four of these blades are like that in Pl. XXV, A, *2;* one is like that in Pl. XXV, A, *5;* one, but smaller, is like that in Pl. XXV, B, *10;* three are like the one in Pl. XXV, B, *11;* and another is like that in Pl. XXV, B, *12*. None is chipped from quartz: the materials are chert, of two different kinds, and red jasper.

LEGEND, PLATE XXV

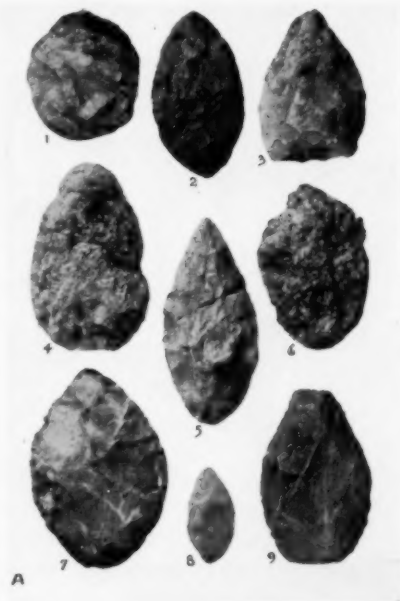
Chipped and Polished Stone Artifacts, Saguenay County, Quebec.

A: *1*, quartz, surface of second terrace about two miles east of Tadoussac (VIII-E-817*a*); *2*, quartz, *3* and *5*, quartzite, collected by F. G. Speck from surface, north of Tadoussac (VIII-E-129, VIII-E-82, VIII-E-117); *4*, quartz, and *9*, slate-like material, general digging, Trench 1, second terrace north of Tadoussac (VIII-E-643*c*, VIII-E-639*a*); *6*, coarse quartz, surface of second terrace north of Tadoussac (VIII-E-584); *7*, grey chert, ten inches below surface, Trench 1, second terrace north of Toudassac (VIII E-652); and *8*, whitish quartz, surface of first terrace about two miles east of Tadoussac (VIII-E-793).

B: *1*, *3* and *8*, quartz, collected by F. G. Speck from north of Tadoussac (VIII-E-131, VIII-E-124, VIII-E-123); *2*, whitish quartz, surface of third terrace north of Tadoussac (VIII-E-699); *4*, chert, *7*, quartzite, and *11*, black chert, surface of first terrace one mile east of Tadoussac (VIII-E-774, VIII-E-776, VIII-E-784); *5*, *9*, *10*, quartzite, and *12*, greyish quartz, surface of second terrace, north of Tadoussac (VIII-E-603*a*, VIII-E-604*b*, VIII-E-582, VIII-E-596); and *6*, green chert, surface of first terrace about two miles east of Tadoussac (VIII-E-803).

C: *1* and *4*, from thin lamella of quartz, surface of third terrace north of Tadoussac (VIII-E-700, VIII-E-698); *2*, quartz, *6* and *14*, whitish quartz, surface of fourth terrace, Marquis farm, north of Tadoussac (VIII-E-743*b*, VIII-E-741*c*, VIII-E-740*m*); *3*, translucent smoky quartz, *10* and *11*, whitish quartz, general digging, Trench 2, second terrace north of Tadoussac (VIII-E-671, VIII-E-670*b*, VIII-E-666); *5*, mottled quartz, and *9*, whitish quartz, surface of second terrace north of Tadoussac (VIII-E-583*k*, VIII-E-583*d*); *7*, chert-like material, collected by F. G. Speck from north of Tadoussac (VIII-E-125); *8*, translucent smoky quartz, surface of first terrace one mile east of Tadoussac (VIII-E-783); *12*, whitish quartz, surface of first terrace about two miles east of Tadoussac (VIII-E-796); and *13*, whitish chert, surface of second terrace about two miles east of Tadoussac (VIII-E-820).

D: *1*, greenish chert, *4*, *9*, *10* and *12*, slate, collected by F. G. Speck from north of Tadoussac (VIII-E-134, VIII-E-145, VIII-E-144, VIII-E-132, VIII-E-139); *2*, grey chert, *11*, slate, and *13*, limestone or slate, surface of fourth terrace, Marquis farm, north of Tadoussac (VIII-E-745, VIII-E-763*a*, VIII-E-764*a*); *3*, olive green material, slate-like, surface of first terrace about two miles east of Tadoussac (VIII-E-809*d*); *5*, sandstone, general digging in Trench 1, second terrace, north of Tadoussac (VIII-E-648*a*); *6* (perhaps concretion) from surface of third terrace north of Tadoussac (VIII-E-712); *7*, hematite, and *8*, slate, surface of second terrace north of Tadoussac (VIII-E-628, VIII-E-617). (½ *natural size.*)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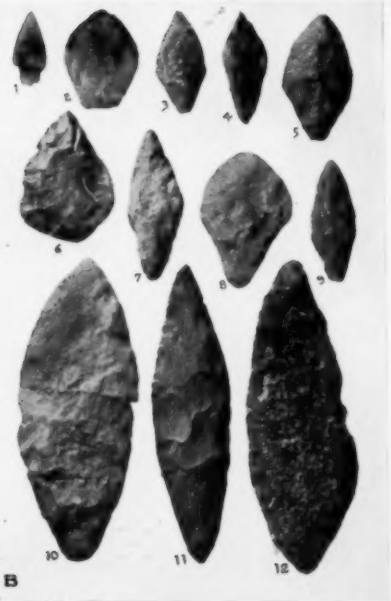
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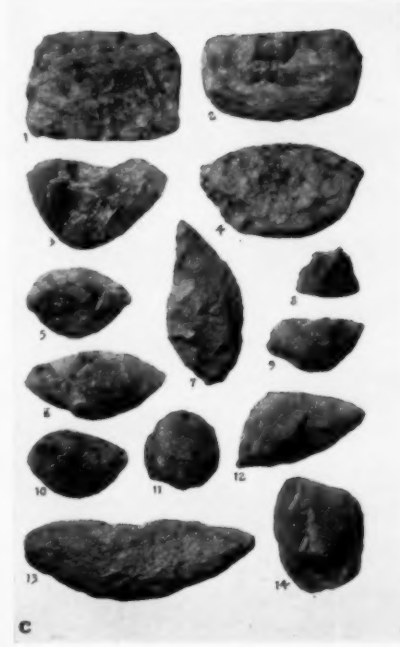
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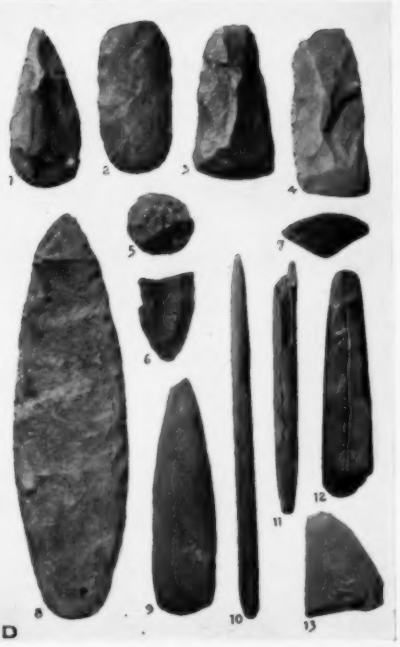
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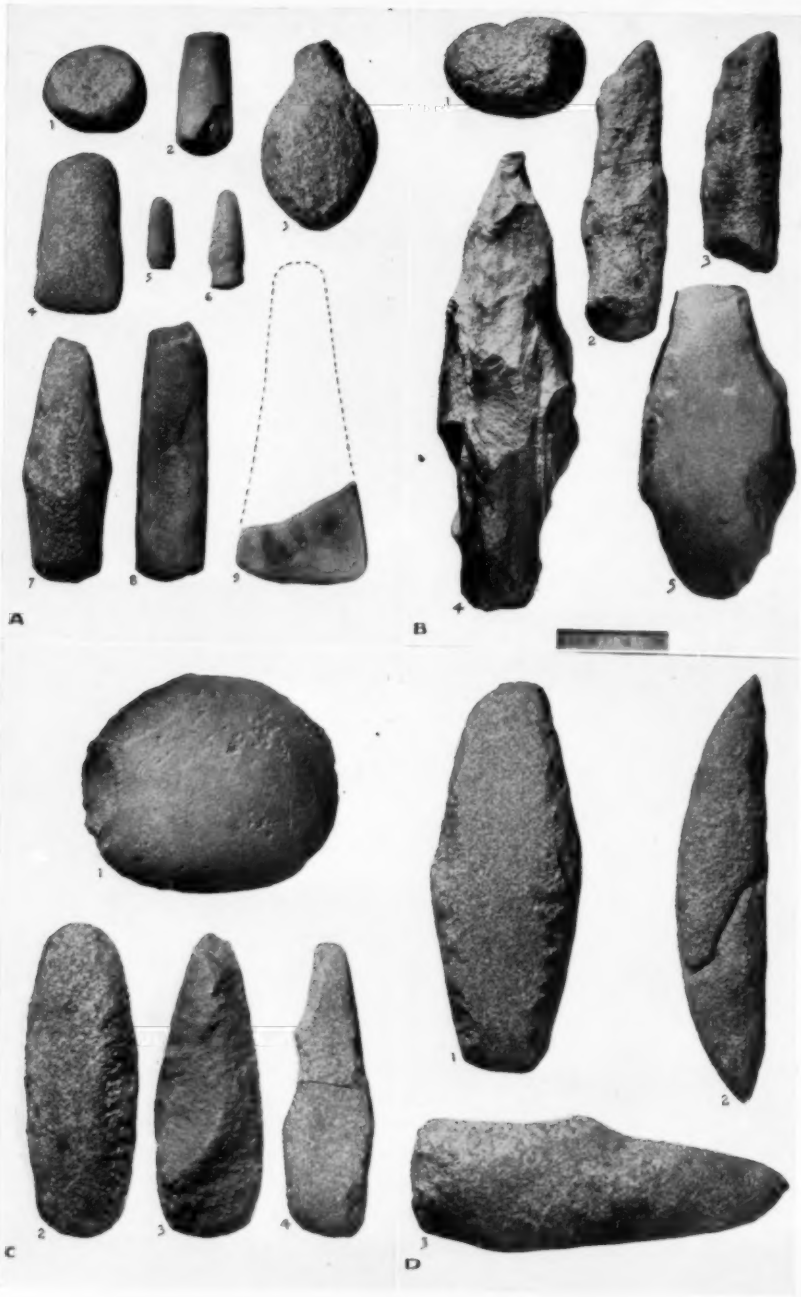
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Fourteen blades are lozenge- or diamond-shaped. Both ends are nearly symmetrical on six of them (Pl. XXV, B, *7*); on one the edges, are almost curved instead of angular. The edges of one specimen slope more to the point than to the base, and they slope more to the base than to the point on four others (Pl. XXV, B, *3*, *4*). Two others have a truncated base and might also be described as pentagonal (Pl. XXV, B, *2*, and Cat. No. VIII-E-740*j*).[14] They are smaller than most of the leaf-shaped blades, for the longest is only about $3\frac{3}{4}''$ [long] and the widest about $1\frac{7}{8}''$ [wide]. Some are very thick, two of the thickest being $\frac{13}{16}''$; but the thickness of the example shown in Pl. XXV, B, *2*, which is flattened on both faces, is only $\frac{1}{4}''$. One of the blades, plano-convex in cross-section and with the under, or flat face unchipped, might be classed as a turtle-back (Pl. XXV, B, *5*); another, double-pointed (Cat. No. VIII-E-118), has a somewhat similar cross-section.

The lozenge-shaped, like the double-pointed, blades may be considered fully developed or specialized; at least the writer has not seen any notched points that appear to be derived from them. The only point that could be conveniently derived from blades of this shape is the long stemmed, shouldered type. Wilson classes the lozenge-shaped points among the stemmed forms;[15] some consider them archaic.[16] It seems significant that most of the blades of this type are chipped from chert, slate, and quartzite, which were less often used for other kinds of blades.

Lozenge-shaped points have a wide distribution along the Atlantic coast, as specimens have been found in New Brunswick,[17] Nova Scotia,[18]

[14] Boas (1907, Fig. 84, *a-e*, *h*) illustrates similar points from Eskimo.

[15] Wilson, 1899, p. 915. [16] Skinner, 1920, p. 166.

[17] There are twelve specimens in the New Brunswick Museum, St. John, two of which are illustrated by McIntosh (1913, Pl. I, Figs. 4 and 5).

[18] Smith, 1929, Pl. IV, Fig. 7, shows a specimen from Merigomish, Pictou County

LEGEND, PLATE XXVI

Stone Artifacts, Saguenay County, Quebec.

A: *1*, faceted hammerstone, and *7* granite, from surface of third terrace north of Tadoussac (VIII-E-702*a*; VIII-E-710, see also Fig. 29 and Fig. 30, *i*); *2*, sandstone, surface of second terrace north of Tadoussac (VIII-E-615); *3*, gneiss, surface west of Tadoussac (VIII-E-616); *4*, epidotised gabbro (?), surface of first terrace about two miles east of Tadoussac (VIII-E-811, see also Fig. 29, *c*); *5* and *8*, collected by F. G. Speck from surface north of Tadoussac (VIII-E-136, VIII-E-146); *6*, epidotised gabbro (?), surface north of Tadoussac (VIII-E-135, see also Fig. 30, *8*); and *9*, collected and presented by Mrs. Wynne-Roberts, surface of second terrace north of Tadoussac (VIII-E-630). ($\frac{1}{2}$ *natural size.*)

B, specimens illustrating manufacture of grooved hammer and adz: *1*, pebble, surface of third terrace north of Tadoussac (VIII-E-705); *2*, *3*, *4* and *5*, surface of second terrace about two miles east of Tadoussac (VIII-E-849, VIII-E-853, VIII-E-823, and VIII-E-826). (*About* $\frac{1}{2}$ *natural size.*)

C: *1*, collected by F. G. Speck from surface north of Tadoussac (VIII-E-80); *2*, epidotised gabbro (?), surface of third terrace north of Tadoussac (VIII-E-709); *3*, altered gabbro, surface of first terrace about two miles east of Tadoussac (VIII-E-809*c*); and *4*, unfinished adz (?), surface of fourth terrace, Marquis farm, north of Tadoussac (VIII-E-762*c*). ($\frac{1}{2}$ *natural size.*)

D, unfinished stone adzes: *1* and *3*, collected by F. G. Speck from surface north of Tadoussac (VIII-E-66, VIII-E-87); and *2*, surface of second terrace about two miles east of Tadoussac (VIII-E-852). ($\frac{1}{2}$ *natural size.*)

New York,[19] Massachusetts,[20] New Jersey,[21] and Georgia.[22]

Only three points, all large, are triangular. One of them has slightly convex edges and base and another [?] has convex edges and a straight base. One (Cat. No. VIII-E-1196) is $\frac{5}{8}''$ thick.

The unilaterally curved blades include two specimens with one edge and base straight and the other curved (Pl. XXV, C, *13*), two others with one edge straight and the base rounded, and twenty-three blades which may be classed as semi-lunar, although it is possible that in some cases this shape was not intentional (Pl. XXV, C, *2–4*, and *9*). One (Cat. No. VIII-F-1199) is of a curious shape. Chipped, unilaterally curved, and semi-lunar blades are seldom found in other sites in eastern Canada;[23] one, chipped from chert, was found in an Eskimo site on Southampton Island, Hudson Bay.[24]

There are only a few quadrangular blades, all of them made from thin, flat faced lamellae of quartz and in most cases with only one margin chipped to an edge (Pl. XXV, C, *1*); several fragments may be parts of similar blades. A few other blades (one is Cat. No. VIII-E-790) were long and narrow with parallel edges, but as both ends are missing it is impossible to say if they were pointed or rounded.

There are forty-six irregularly shaped blades, mostly crudely chipped into shape, one of which is seen in Plate XXV, C, *14*.

Twenty blades have a stem worked out at the broader end (Pl. XXV, B, *9*), but in most cases they are not shouldered and are scarcely distinguishable from the double-pointed leaf-shaped blades. The one illustrated, of quartzite, is unusually well chipped, considering the nature of the material.

Only one notched point is known from these sites: it was found by Speck on one of the terraces north of Tadoussac (Pl. XXV, B, *1*). It is about $\frac{5}{32}''$ thick. A visitor from the United States is said to have found a notched spear point on the surface of the second terrace above the St. Lawrence, about two miles east of Tadoussac.

Very few of the points are small enough to be classed as arrowheads.[25] A few of the small, lozenge-shaped specimens may have been intended for the purpose, but are just as likely to have been knife blades,

[19] Wilson, 1899, Pl. 33, Fig. 13, shows a point from Queens County, and Skinner, 1920, Pl. IX, shows several from Manhattan Island. [20] Wilson, 1899, Fig. 140.

[21] *Ibid.*, Pl. 33, Fig. 8. [22] *Ibid.*, Pl. 33, Fig. 9.

[23] A specimen, $2\frac{1}{4}'' \times 1\frac{3}{16}'' \times \frac{5}{16}''$, pointed at both ends and with one edge slightly, and the other extremely, curved, curiously enough, was found in what was probably an early Huron site on lot 13, con. III. Vaughan Township, York County, Ontario (Cat. No. VIII-F-22870, Nat. Mus. Can.). [24] Mathiassen, 1927, Pl. 70, Fig. 2.

[25] Most of the chipped stone points from Red Paint graves are also too large for the purpose (Moorehead, 1922, p. 111).

the pointed end being inserted in a hole in the handle. Probably many of the large, leaf-shaped blades, especially the double-pointed specimens, were used as knives, "with a piece of skin wrapped around one end as a handle," as Speck suggests[26] others may have been points for spears. The unilaterally curved blades, judging from their shape, must have been knives, and perhaps, also, some of those classed as semi-lunar, especially the unusual one in Plate XXV, C, *3*.

Scrapers. A scraper made from a crude, trapezoidal plano-convex chip of translucent quartz, retains the original plane of fracture on the lower face and has the edge chipped to an abrupt bevel (Pl. XXV, C, *8*). One consists of a plano-convex quartz chip with one end trimmed to a beveled edge (Cat. No. VIII-E-1205). One, derived from an oval chip of quartz crystal, $1\frac{1}{8}'' \times 1'' \times \frac{5}{16}''$, has one long side chipped to a sharp beveled edge (Cat. No. VIII-E-557*g*). Speck found two plano-convex specimens (American Museum of Natural History) one of which is chipped from greenish grey chert and the other from jasper.

The circular, roughly plano-convex object chipped from white quartz, and illustrated in Plate XXV, C, *11*, may likewise have been used as a scraper. Still another (Cat. No. VIII-E-104*e*) consists of an irregularly circular, whitish quartz blade, lenticular in cross-section, chipped to a cutting edge all round; it is about $1\frac{1}{4}''$ in diameter and $\frac{3}{8}''$ thick. A specimen, perhaps also used as a scraper, is made from part of a quartz crystal, of which the natural planes are retained on one side; one long edge of the unfractured side is retouched for use (Cat. No. VIII-E-685*a*).

Chisel-like Objects. Another class of objects chipped from stone consists of blades with one end ground to a sharp, convex cutting edge; this is the only part that is ground into shape, the chipping conchoids remaining on the rest of both faces. Probably most of these artifacts were never intended to be completely smoothed. The smallest one, leaf-shaped, is $\frac{1}{2}''$ thick (Pl. XXV, D, *1*). Another leaf-shaped specimen $3\frac{3}{16}'' \times 2\frac{1}{16}'' \times \frac{1}{2}''$ (Cat. No. VIII-E-753), is chipped from sandstone and much sand-eroded; it was found on the fourth terrace north of Tadoussac. A small, nearly rectangular specimen, $\frac{5}{32}''$ thick, is seen in Plate XXV, D, *4*. An unfinished specimen ($3\frac{1}{16}'' \times 1\frac{1}{16}'' \times \frac{1}{2}$) of dark grey slate with the edge unground is from the fourth terrace (Cat. No. VIII-E-751). The largest whole specimen (Pl. XXV, D, *8*) is $\frac{1}{16}''$ thick. There are two fragments of what seem to have been specimens of the same kind as the last, one from the fourth terrace (Cat. No. VIII-E-746) chipped from mottled chert, and the other, from the second terrace about two

[26] Speck, 1916, p. 431.

miles east of Tadoussac (Cat. No. VIII-E-812), from a hard, grey rock resembling slate; both are $\frac{5}{16}$" thick. The specimen in Plate XXV, D, *3*, which is $\frac{7}{8}$" thick at the blade end, is ground abruptly from both faces to form a dull cutting edge, and decreases in thickness to the poll where it is $\frac{5}{16}$" thick.

A specimen chipped from grey slate ($5\frac{3}{4}$"×$1\frac{1}{2}$"×$\frac{3}{8}$"; Cat. No. VIII-E-1203) has a ground convex cutting edge at each end.

Rough Stone Artifacts

The artifacts of rough stone consist of percussion and pitted hammerstones, disk pounders, and lap stones or anvils, most of which received their present shape through use.

Percussion Hammers. One hundred and sixty-nine percussion or battering hammers were found by the writer, and one by Speck. They are of two kinds. One type, of which there are twenty-four specimens, consists of irregularly shaped, round or oval, waterworn pebbles which were utilized without shaping for use. They show battering on one or both ends and, in some cases, on the sides; only one is faceted. The other hammers, the majority of which are more specialized, seem to have been intentionally made for the purpose by chipping and breaking, although some of them retain parts of the waterworn surface of the stone from which they were derived. A few appear to have been originally, small, disk pounders which were reduced to their present size and shape by long use; one specimen is derived from a small spall $\frac{1}{2}$" thick. Only a few are nearly spherical; most of them are oval and angular. A few of the round and oval specimens are lens-shaped; one is somewhat plano-convex, and a few flattened on both faces (Pl. XXVI, A, *1*). Some of them have only one end battered, others, two ends and one or more sides, as in the case of the angular specimens, the more prominent angles. Others have the entire periphery battered, and a few are faceted. They are mostly of a size that could be easily held in the hand, being about 2" by $2\frac{3}{4}$". Only a few exceed $3\frac{1}{2}$" in diameter. The smallest specimen is $1\frac{3}{4}$"×$1\frac{7}{8}$"×$\frac{7}{8}$". Most of them were probably held between the tips of the thumb and index finger for chipping, and more especially, for pecking or battering.

Only three of the hammers are of quartz. This material was unsuitable for this use, owing to its tendency to splinter and break. Quartzite is tougher, but was used here about as seldom. About half of all the hammers are made of a hard, tough, dark grey rock, almost black in some cases. Others consist of nodules of black chert. Many others are of a softer grey rock, and a few are of granite-like rock, limestone, greenstone, slate, or sandstone. A few nodules of ilmenite (Cat. Nos. VIII-E-

629 and VIII-E-756) and one of hematite (Cat. No. VIII-E-855) also appear to have been used as hammers.

Pitted Hammerstones. Only two pitted hammerstones were found. One, a large pebble of grey rock ($2\frac{3}{8}'' \times 4\frac{3}{16}'' \times 3\frac{1}{4}''$), roughly pitted on both flat faces, was found on the surface of the fourth terrace, north of Tadoussac (Cat. No. VIII-E-704). The other, of granite, about $4\frac{5}{8}'' \times 4\frac{3}{8}'' \times 2\frac{1}{2}''$, has large pits on both faces, one of them about $1\frac{1}{2}''$ wide and $\frac{5}{16}''$ deep, the other not so deep, and irregular in outline. The entire periphery of this specimen is battered. It comes from the surface of the second terrace north of Tadoussac (Cat. No. VIII-E-624).

Disk Pounders. Disk pounders, a term suggested by Speck,[27] well describes the shape and probable function of twenty-eight specimens consisting of roughly plano-convex (in a few cases somewhat double-convex) spalls broken from small boulders of red gneiss, diabase, and diorite. They are irregular, oval, pear-shaped, roughly half round, or nearly circular in outline, but most of them are either oval or irregular. The oval specimens vary in size from one that is $3\frac{1}{2}'' \times 4\frac{1}{2}''$ to one $7\frac{1}{4}'' \times 5''$. The circular or nearly circular specimens are $3\frac{1}{4}''$ to $6''$ in diameter. They vary in thickness from $\frac{15}{16}''$ to $2\frac{1}{4}''$. All of them retain the rounded waterworn surface of the rock on one face. In a few cases, the broken faces seem to have been scabbled or dressed into shape; one specimen has been trimmed on both faces. Most of them have only one edge or parts of the edge battered, whereas on others, especially the nearly circular specimens, there are marks of battering on almost the entire periphery. Part of the edge of the specimen shown in Plate XXVI, C, *1*, is worn smooth from use in some other operation; perhaps it was used in the same way as the "teshoa" scrapers in tanning hides.

These pounders were well suited to break up rocks; the larger specimens probably required the use of both hands, owing to their weight.

Similar specimens do not seem to occur at other sites elsewhere in the east, and the writer has seen an illustration of only one specimen from the middle west, from Minnesota.[28] It is a large, roughly oval specimen, about $6''$ long and $\frac{3}{4}''$ thick, with all but the thickest edge sharpened and shaped by chipping. Some of our specimens are also very like the "boulder chips" from Cook Inlet, Alaska.[29]

Lap Stones or Anvils. A few small boulders with one side deeply scarred, probably from use as anvils on which rocks were roughly broken or chipped into shape, were seen on the second terrace north of Tadoussac.

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[27] 1916, p. 432.

[28] Winchell, 1911, Pl. III, Fig. 4.

[29] See de Laguna, 1934, Pl. 20, Figs. 7 and 8.

The pitted hammerstones, especially those with deep, angular pits, may also have been used as anvils in some cases.

Spade or Mattock. The side edges and the smaller end of a plano-convex spall from a small boulder of what looks like epidotised gabbro ($7\frac{3}{16}'' \times 4\frac{7}{8}'' \times \frac{11}{16}''$ Cat. No. VIII-E-658); present a worn appearance as if the spall had been used as a spade or mattock. The presence of a shallow notch on one edge and two others on the opposite edge, near the top, suggests that it had been lashed to a handle; and a small, smooth area on the broken face, between the notches, seems, indeed, to have been caused by friction of some loosely fastened handle. Although most blades used as spades and hoes found elsewhere on this continent are considerably polished from long use, the lack of polish on this specimen may be due to subsequent sand erosion.

Pecked, Ground and Polished Stone Objects

The pecked, ground, and polished stone artifacts consist of lance-like points, a knife-like object, adzes, chisel-like objects, gouges, a plummet, a whetstone, and a few fragments of objects of unknown use. There were fewer objects of this class than of chipped and rough stone.

Lance-like Points. About thirty fragments, but no complete specimens, of lance-like points of grey slate were found. They are mainly parts of shafts, but there are a few pieces that retain the tip and others, the base. The points appear to have been about 8″–10″ long, judging from the length of the most complete specimen secured by Speck, which is $7\frac{3}{4}''$ long. This specimen (Pl. XXV, D, *10*) has a pointed tip; the tip of another is obtusely pointed. The basal ends of three fragments taper to a rounded tip, about $\frac{1}{4}''$ in diameter (Pl. XXV, D, *11*). Most of the points are more or less cylindrical, one is half round, a few are oval, one is nearly square, and another is partly square and partly oblong or almost rectangular in cross-section. The average diameter is about $\frac{1}{2}''$; one of the thickest pieces is $\frac{7}{8}''$. In two cases, part of the shaft is bulged. Many of the points are made of a poor quality of slate and are cracked and slivered from exposure to frost and sun, and some are sand-eroded. A few are highly polished.

It is not certain for what purpose these objects were used. Speck says "The Montagnais recognize these traditionally as harpoon heads"[30] and this probably was their function. Somewhat similar points made of the same kind of material, but mostly somewhat square in cross-section, from British Columbia, are considered lance or harpoon heads.[31] They

[30] Speck, 1916, p. 431.

[31] Cat. Nos. XII-B-182 and XII-B-183, National Museum of Canada.

are also like the whaling lance blades used by Kodiak Eskimo, and the awl-like blades, some of which are round, oval, or square, in cross-section, found in sites in Kachemak Bay and Prince William Sound, Alaska.[32]

Speck speaks of these as being similar to the long lance-like points found by Moorehead in "Red Paint" graves in Maine, but they are by no means similar, because the "Red Paint" points are broad and hexagonal,[33] whereas those from Tadoussac are mostly round in cross-section and are shaped like punches.[34] The author has not seen similar points from elsewhere in the St. Lawrence Valley or in the Maritimes, and they also do not seem to occur in New York and the New England states.[35] Mr. Norris L. Bull of Hartford, Connecticut,[36] in a letter to the writer, says: "We do not encounter the type of slate lance point you describe. Ours are either the "Red Paint" Maine type or the Vermont-Lake Champlain shapes." Objects apparently of the same kind have been found in Newfoundland,[37] but whether in Beothuk or Eskimo sites is uncertain.

The long, narrow piece of chipped and sawed slate described below as possibly being an unfinished adz or chisel, may have been in process of manufacture into lance points.

Slate Spear, or Knife, Point. A small fragment of a polished slate spear or knife point, nearly diamond-shaped in cross-section, and $\frac{5}{16}$" thick, was found on the surface of the first terrace about two miles east of Tadoussac (Cat. No. VIII-E-813). It was probably of the stemmed and shouldered but not barbed type of point found elsewhere in eastern Canada, in the New England states, especially in "Red Paint" graves in Maine,[38] and in Newfoundland.[39]

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[32] de Laguna, 1934, Pl. 36, Figs. 12–14 and 16, 17.

[33] Moorehead, 1922, Fig. 46.

[34] Resembling these objects, except that they are perforated, are a cylindrical, spindle-shaped slate specimen from Fort Hill, Veazie, near Oldtown, Maine, and casts of two similar specimens from unknown localities, in the Museum of the Department of Archaeology, Phillips Academy, Andover, Massachusetts, of which Mr. Frederick Johnson kindly furnished a photograph. One is illustrated by Willoughby (1935, Fig. 45*d*). It is possible that our specimens are unfinished and were also intended to be perforated.

[35] Moore, 1900, found on the west coast of Florida a strikingly similar, cylindrical clay stone object 13.12 inches long, but with a narrow wedge-shaped base (Fig. 19). A small specimen of the same shape, but only about 4½ inches long, and ⅜ inch thick, was also found (Fig. 26). [Specimens strikingly similar have recently been discovered in a "Red Paint" grave in Brewer, Maine, by Mr. Hadlock. Ed.]

[36] Letter of October 26, 1932. [37] Howley, 1915, Pl. XIX, Figs. 6 and 8.

[38] Moorehead, 1922, Fig. 57, top row, and point at left in lower row.

[39] Howley, 1915, Pl. XIX, Figs. 1–5 and 24.

Stone Adzes. The ground and polished stone adzes found here are of four different kinds. One kind, so far as can be determined from the forty-six or more fragments, consists of long, slender specimens, some of them of the same shape as the one shown in the restoration Figure

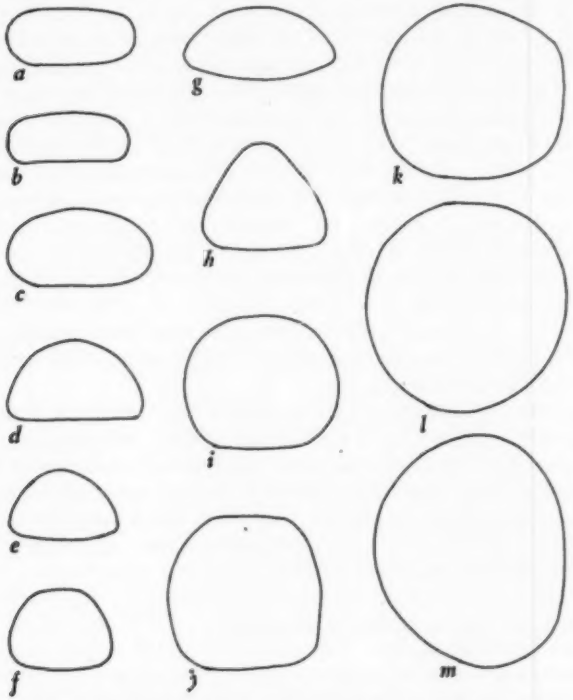

FIG. 29.—Cross-sections of finished and unfinished adzes, Quebec. *a* and *c*, see Pl. XXVI, A, *8* and *4; b*, No. VIII-E-149*c*; *d*, No. VIII-E-99; *e*, No. VIII-E-619*b; f*, No. VIII-E-759*a; g*, No. VIII-E-620*g; h*, No. VIII-E-760*b; i*, see Fig. 30, *6; j* and *l*, see Pl. XXVI, D, *2* and *3; k*, No. VIII-E-851; and *m*, see Pl. XXVI, B, *3*.

30, *2*. The front is convex from end to end (Fig. 30, *1*) and from side to side, and the back in most of them is flattened, making the cross-section half round (Fig. 29, *d*). In a few, however, the backs are convex from side to side (Fig. 29, *e*), and in a few others slightly concave. One

adz, of which a fragment was collected by Speck, while of the same general type, was flattened on the lower half of the front (see cross-section in Fig. 29, *b*). They all seem to have been bi-symmetrical as viewed from the front. The majority seem to have been slightly wider at the middle than at the cutting end. In some, the sides appear to have been parallel for part of the length, but to taper toward the poll, which in most cases seems to have been narrower than the cutting edge. The tip of the poll fragment outlined in Figure 30, *3*, has been ground almost to a point and the back slopes sharply to the front. The poll of a few specimens curves outward (Fig. 30, *4* and *5*) a feature seen on only one other specimen of which the writer has any record.[40] One is shaped like the outline in Figure 30, *7*. Two poll fragments collected by Speck (Pl. XXVI, A, *5* and *6*) are grooved across the front and sides, the groove in the one outlined in Figure 30, *8*, being $\frac{5}{8}''$ wide, but only about $\frac{1}{16}''$ deep. The sides and front of another poll fragment, also collected by Speck, are slightly incurved (Cat. No. VIII-E-138). All the specimens have a convex cutting edge, in some cases like that outlined in Figure 30, *9*, and in others like that in *10* of the same cut. The shape of two fragments of unfinished adzes suggests that in some cases the edges were flared[41] (see outline in Fig. 30, *11*); a feature rarely seen on adzes or ungrooved axes. A fragment of another apparently unfinished specimen, although slightly wider and thicker than most of the adzes found here, has a small, rounded knob on the front,[42] evidently for holding the lashing with which it was secured to the handle (see outline of side in Figure 30, *12*). Several other adz fragments (American Museum of Natural History) that were collected by Speck north of Tadoussac seem to have been similarly knobbed.

The sizes of the adzes, as judged from the fragments, were $1\frac{3}{16}''$-$1\frac{7}{8}''$ wide (the majority of them about $1\frac{1}{2}''$ and $1\frac{3}{16}''$) and from $\frac{3}{4}''$ to $1\frac{5}{8}''$ in thickness. Only one could be reconstructed (Cat. No. VIII-E-809*a*); it is $8\frac{1}{8}''$ long. Another was probably $9\frac{1}{4}''$ to $10''$ long. The more slender specimens, with parallel sides, may have been even longer. A poll of what seems to have been a beautifully proportioned specimen from the fourth terrace, Marquis farm, $2\frac{3}{4}''$ long, is $1''$ wide, and $\frac{3}{4}\frac{5}{8}''$ thick at the break, whence it tapers to a rounded poll about $\frac{6}{16}''$ in diam-

[40] It is from Wenham, Massachusetts, and is illustrated by Abbott (1881, Fig. 32).

[41] One from Coahoma County, Mississippi, is illustrated by Peabody (1904, Pl. XVII, Fig. 4).

[42] Compare with similarly knobbed stone adzes and gouges from Nova Scotia (Piers, 1896, Pl. I, Fig. 22, and Pl. II, Figs. 47 and 63, the latter a gouge) and Maine (Moorehead, 1922, Fig. 50, at left, and Fig. 51, at top).

eter (Cat, No. VIII-E-761*e*). This adz was probably less than $1\frac{1}{4}''$ wide when whole.

It is hard to say why all the adzes of this type were broken, in some cases into five or more pieces, and mostly straight across, because in every case the cutting edge is intact, and only one shows abrasions on the front or back of the break that would suggest either accidental or deliberate breaking. It is possible that they were broken through exposure to intense cold, as Speck suggests.

Adzes of this long, slender type are of rare occurrence elsewhere in eastern Canada. The writer did not find any in the course of a reconnaissance in the St. Lawrence Valley between Tadoussac and Montreal and from the Labrador-Canada boundary to Seven Islands on the north shore of the Gulf of St. Lawrence. Piers figures what seem to be specimens of the same type from Nova Scotia,[43] but it does not seem to be a shell-heap form.[44] Others, also of this type, were found by Moorehead in "Red Paint" graves, but the cutting edges of most of them are straight.[45] According to Moorehead, this type of adz is distributed through New England, New York, and Pennsylvania.[46] Mr. Bull of Hartford, Connecticut has two or three adzes from Connecticut, of the same general proportions as some of the Tadoussac specimens, "except that the cutting edge is not quite so rounding."[47] The writer has seen only five similar specimens from Ontario.[48] Mr. Charles E.

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[43] Piers, 1896, Pl. I, Figs. 31, 32 and 34–36, and Pl. II, Figs. 38–42 and 46.

[44] With one exception all the stone adzes from shell heaps near Merigomish, Pictou County, and Mahone Bay, Lunenburg County, Nova Scotia, are short and broad with oblong cross-section. The only narrow adz from a shell heap that the writer has seen comes from Olding Island, Merigomish (Cat. No. VIII-B-562, Nat. Mus. Can.) It is only $6\frac{3}{4}$ inches long, much broader in proportion to its length than any of the Tadoussac specimens, not so gracefully proportioned, but is half-round in cross-section.

[45] Moorehead, 1922, Fig. 42, third and fourth specimens from left. An adz from Surry, Maine, shown third from right in his Fig. 19, but which he does not consider a Red Paint type, also closely resembles Tadoussac forms.

[46] Letter of October 17, 1932. [47] Letter of October 26, 1932.

[48] There are four adzes of the same type from Middlesex County (Cat. Nos. 2200, 2216, 41890, and 41892) in the Provincial Museum Collection, Royal Ontario Museum of Archaeology. No. 2200 is broader at the middle than most of those from Tadoussac, is half round in cross-section with flat back, and is 9″ long, 2″ wide, and $1\frac{3}{8}''$ thick. No. 2216 is convex from end to end, has a flat back, a half round cross-section, a roughly pointed poll, and is 8″ long, $1\frac{1}{8}''$, and $1\frac{1}{2}''$ thick. Nos. 41890 and 41892, which are from lot 30, con. IV, London Township, are half round in cross-section with a flat back. A third one is from lot 19, con. XII, Blenheim Township, Oxford County (in Prov. Mus. coll., Royal Ont. Mus. Arch., Toronto, Cat. No. 24366); it is $8\frac{1}{4}''$ long, $1\frac{15}{16}''$ wide, and $1\frac{5}{16}''$ thick, with the back slightly hollowed. One of the same type, but only $5\frac{3}{4}''$ long, comes from Brant County (Cat. No. 1436, in Prov. Mus. coll., Royal Ont. Mus. of Archaeology).

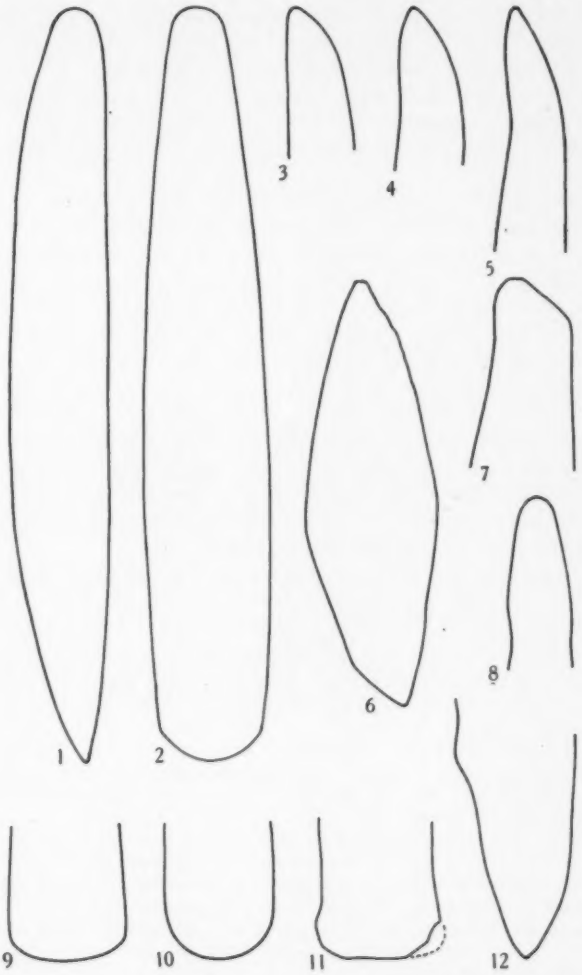

FIG. 30.—Outlines of adzes, Quebec. *1* and *2*, conjectural restoration of front and side of one Tadoussac type; *3*, *4*, side, and *11*, expanded part, surface of second terrace north of Tadoussac (VIII-E-618*d*, VIII-E-618*a*, VIII-E-620*j*); *5*, side, surface of fourth terrace, Marquis farm (VIII-E-761*c*); *6*, side, see Pl. XXVI, A, *7*; *7* and *12*, side, collected by F. G. Speck from north of Tadoussac (VIII-E-71, VIII-E-97); *8*, see Pl. XXVI, A, *6*; *9*, shouldered cutting edge; and *10*, extremely convex cutting edge.

Brown, Secretary of the Wisconsin Archaeological Society, Madison, says stone adzes of the same slender proportions "are quite widely distributed throughout southern and central Wisconsin."[49] They seem to be rare elsewhere in the United States.[50] The shapes and dimensions of these Tadoussac specimens are also more like those of some gouges from "Red Paint" graves[51] than most other adzes from Ontario and Quebec.

Adzes of nearly the same type, but mostly shorter and not so narrow or slender, and with a half round cross-section, have been found in several different localities in Ontario;[52] most of them, however, are more bulged laterally, and from front to back, than those from Tadoussac.

The second kind of adz, of which there is only a fragment bearing the cutting edge, seems to have differed from the long, slender specimens in being broad at the bottom, whence the sides taper to the poll. It is an excellent piece of stone work, made from a material resembling syenite, and is convex from side to side on both faces, but more so on the front than on the back, making it somewhat lenticular in cross-section (Fig. 29, *g*). It appears to have been convex also from end to end on both faces, but less so on the back than on the front, and to have been bilaterally symmetrical as viewed from the front. The cutting edge, now broken, was curved and about $2\frac{1}{8}$″ wide.

The writer has seen only one other adz that seems to be of nearly the same type, although it may be shorter. It is made of the same kind of material, is convex on both faces from end to end and from side to side, has practically the same cross-section and has a convex cutting edge.[53]

The third kind of adz is long, with more or less parallel sides and faces, and is oblong in cross-section. There are two specimens of this

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A long slender specimen from Point Edward, Lambton County (Cat. No. 3784, Prov. Mus. coll.), seems to be of the same type as some of the more slender adzes of which fragments were found here. It is $8\frac{5}{16}$″ long, $1\frac{3}{8}$″ wide near the middle, and $\frac{7}{8}$″ thick. The cutting end, thinned but not ground to an edge, is 1″ wide. The sides taper from the middle to the poll, which is rounded and about $\frac{3}{8}$″ in diameter. Both front and back are flattened, but the front less than the back. Another specimen, with the poll end missing, is half round in cross-section but has the cutting edge wider than the middle, although it is not flaring; it is from Yarmouth Township, Elgin County (Cat. No. VIII-F-5635, Nat. Mus. Can).

[49] Letter of Jan. 22, 1930. See also Crosby (1903, frontispiece, Fig. 1) which is very much like the one in our Pl. XXVI, D, *2*.

[50] An adz of nearly the same type was found in Arkansas (Moore, 1910, Pl. XXVIII).

[51] See Moorehead, 1922, Fig. 19, second from left.

[52] See Wintemburg, 1931, Pl. VI, Fig. 2, showing one of this type from Tuckersmith Township, Huron County.

[53] From Houghton Township, Norfolk County, Ontario (Cat. No. VIII-F-4283, Nat. Mus. Can.).

kind, one of them a fragment. Both are nearly bilaterally symmetrical as viewed from the narrow sides, and so may also have been hafted as axes or tomahawks. The cutting edge of both specimens is curved, only the lower third of the one in Plate XXVI, A, *8*, is polished; the rest of the specimen retains marks of pecking, and some chipping conchoids. The poll is broken. It is about $\frac{3}{4}''$ thick. The fragment (Cat. No. VIII-E-810*a*), which seems to be part of a large adz, is of banded slate, and is $2\frac{1}{2}''$ wide at the cutting edge and $\frac{7}{16}''$ thick. Similar adzes are not common elsewhere in eastern Canada.

The fourth kind of adz, of which two specimens were found, one a fragment (Cat. No. VIII-E-810*c*), consists of short, thick specimens. The one in Plate XXVI, A, *4*, is made of diorite or diabase and is flatter on one face than on the other. The upper two-thirds and the poll are roughened, but this may be due to sand erosion. The blade end alone is polished on both faces. It is $1\frac{1}{16}''$ thick. The second, broken, specimen, made of a soft, grey rock, about $1\frac{3}{16}''$ thick, with one face more or less flat and the other convex, has an oblique cutting edge, and was probably of the same type. Both faces, the sides, and the edge are considerably sand-eroded.

Manufacture of Stone Adzes. A most instructive series of over one hundred specimens illustrating stages in the manufacture of stone adzes was secured. They comprise rudimentary forms derived from spalls, rudely roughed-out forms, and a few that are nearly completed. Many of them are broken. Some, especially the bulged specimens, may have been used in their present shape, that is, without completing them.

More than half of the rudimentary forms are derived from plano-convex spalls broken from large boulders, and retain part of the waterworn surface of the rock from which they are broken. A few of the spalls are unworked, but were evidently intended for transformation into adzes. A few others have the rough surface of the fractured face carefully dressed until it is almost even. The long edges of a few specimens are chipped or broken into shape; others have parts of the waterworn surface chipped. The next step was to batter the long edges, probably with hand or percussion hammers of the kind described on page 324, which was continued until both edges or sides were reduced to the desired width. The waterworn surface seems to have been next attacked, but judging from the few specimens showing pecking on this face, only the unnecessary parts were removed by this method, for in only a few specimens does the pecking extend over most of the waterworn surface. The back, or what was originally the fractured surface, appears to have been the last to be battered into shape, but only a few objects show evidence of this process. A few specimens were now ad-

vanced to a form suggesting an adz (Pl. XXVI, D, *2*). One of these nearly completed specimens, collected by Speck, has most of the surface battered and was reduced to a form nearly square in cross-section, but ridged lengthwise on the back (Cat. No. VIII-E-68). One of the wedge-shaped ends of the forms derived from spalls required very little grinding to produce the cutting edge, and very little breaking, battering, and grinding was needed also to produce a poll like that on most of the long, slender adzes found here. In one case, the smaller end was pecked from both faces until wedge-shaped. The convex, waterworn surface of the spall in most cases forms the front of the unfinished adzes and apparently also of the completed ones (Pl. XXVI, D, *2*).

The body in seven specimens is bulged laterally at the middle, but the workmen may have intended to remove these bulges before the form was brought into shape for grinding. It is also possible, however, that specimens of this shape were in process of manufacture into a type of implement of which we found no completed examples. One of the best specimens is shown in Plate XXVI, A, *7*. Six other forms (Cat. Nos. VIII-E-64, VIII-E-609*b*, VIII-E-758*b*,[54] and the one in Plate XXVI, D, *1*)[55] are somewhat like it except that they are much wider and longer, but not so thick in proportion to the width (the one in Plate XXVI, D, *1*, is $1\frac{5}{8}$″ thick); they look almost as if they had been intended for grooved axes. Other peculiarly knobbed, unfinished specimens are seen in Plate XXVI, B, *2*, and C, *4*.

The unfinished form derived from a spall, (Pl. XXVI, B, *2*), appears to have been in process of manufacture into a broad, thin adz, unless it was used, without further modification, in digging. It is convex from end to end and from side to side, 7″ long, and 1″ thick.

Rudely roughed-out forms were nearly as common as those derived from plano-convex spalls. They were broken and chipped until they were of the desired shape, but in this preliminary stage the danger of breaking by a misdirected blow of the hammer naturally became greater as the form became thinner. Forms of this class went through the same processes in the final stages of manufacture as those derived from spalls, except that the entire surface of the form was subjected to pecking to efface the chipping conchoids and other irregularities.

Some of these rough forms, one of which is seen in Plate XXVI, C, *3*, were intended for adzes of a different type from the long slender specimens; in fact some of the cruder forms do not bear even a remote

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[54] The rest, collected by Speck north of Tadoussac, are in the American Museum of Natural History, New York. [55] The outline of the side is seen in Fig. 30, *6*.

resemblance to the finished adzes of that type. Some are so crooked that it was impossible to shape them into straight blades. If the large bulged specimens (Pl. XXVI, B, *4*), which Speck considers pestles,[56] but which the writer believes were unfinished adzes, were in process of transformation into adzes of the long, slender type, it must have required considerable pecking or battering to reduce them to the slender proportions of some of those adzes. In some cases, those with knob-like projections on what seems to have been intended for the front of the blade may have been in process of shaping into knobbed adzes. In at least one case, however, the presence of the knob seems to have been due to a different degree of hardness in one part of the rock (Pl. XXVI, D, *3*).

The unfinished form, of which one side is shown in Plate XXVI, B, *3*, is somewhat oval in cross-section (Fig. 29, *m*) and has been pecked to form grooves across the front, but it is not certain whether these were intended to be permanent features or are due to the method used in reducing the thickness. No completed grooved adzes were found. Another unfinished specimen, collected by Speck, and now in the American Museum of Natural History, is spirally grooved.

Another interesting unfinished specimen is shown in Plate XXVI, B, *2*. The larger end shows what seems to be one method of removing a large, undesired projection from the side of what was evidently intended to be the cutting end. The peculiar shape of the top suggests that it may have been in process of transformation into an animal head like that on a stone adz from Connecticut.[57]

Eighteen nearly complete forms are derived from spalls and roughed-out forms that only need grinding to transform them into adzes ready for use.

The size of the finished adz was largely governed by the shape and dimensions of the spall or of the rudimentary form derived from it. This varies from $5\frac{1}{4}$″–14″ in length, from $1\frac{7}{8}$″–6″ in width, and from 1″–$4\frac{3}{8}$″ in thickness.

Part of what seem to be poll ends of three unfinished adzes are shaped somewhat like tenons.[58]

Gouges. Five stone gouges, all either fragments or more or less

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[56] Speck, 1916, p. 431. It was hardly necessary to go to the trouble of laboriously breaking out such forms when waterworn stones of suitable size and shape were available.

[57] Willoughby, 1935, Fig. 22*e*.

[58] One, collected by Speck, is in the American Museum of Natural History, and another collected by him is Cat. No. VIII-E-140*e*, in the National Museum. The third specimen was found by the writer on the surface of the site on the fourth terrace, Marquis farm (Cat. No. VIII-E-759*a*).

broken, are known to have been found at these sites, four, now in the American Museum of Natural History, by Speck, and the other by the late Mrs. Wynne-Roberts of Toronto, who kindly presented it to the National Museum of Canada. Two of those collected by Speck are merely broken middle sections. The other two have the poll broken off and are fractured and abraded at the lip. One of these, of granite-like rock, with a curvilinear-triangular cross-section and about $1\frac{9}{16}'' \times 1\frac{7}{16}''$, was hollowed from end to end (Cat. No. 20./7055). The other (Cat. No. 29./9054), with a half round cross-section at the middle and at the broken top, was deeply hollowed for less than half the length. The hollow, rounded at the top, is about $\frac{1}{2}''$ deep, and the cross-section here is crescentic. Its present length is about $7\frac{1}{4}''$ and it is about $1\frac{7}{8}''$ wide and $1\frac{1}{16}''$ thick. The fragment found by Mrs. Wynne-Roberts (Pl. XXVI, A, *9*), is part of a blade and is $2\frac{15}{16}''$ wide across the cutting end. The hollow is only about $\frac{1}{8}''$ deep at $1''$ above the edge. It is $\frac{7}{16}''$ thick at the broken end. Judging from the shape of this fragment, it appears to be part of a gouge with flaring sides, similar to two specimens found in "Red Paint" graves in Maine, although the sides do not appear to have been incurved.[59]

Polished Chisel-like Tools. A small chisel-like tool of grey slate (Pl. XXV, D, *9*), with most of the sides and both faces polished, was found by Speck on one of the terraces north of Tadoussac. It is lenticular in cross-section and about $\frac{15}{32}''$ thick.

A fragment of a long and slender unfinished object (Cat. No. VIII-E-679) may have been in process of manufacture into a chisel-like tool like that in Plate XXV, D, *9*, or the adz in Plate XXVI, A, *8*. It is about $8'' \times 1\frac{3}{8}'' \times \frac{5}{8}''$ and has long, nearly straight, parallel edges, one of them formed by longitudinal cutting and breaking. Both faces are almost flat but have not been smoothed, and parts of both edges have been chipped from each face.

Plummet. A large, apparently unfinished, pear-shaped plummet ($4\frac{3}{8}'' \times 2\frac{5}{8}'' \times 2''$) of gneiss, roughly oval in cross-section (Pl. XXVI, A, *3*),was found on a wind-swept, sandy spot north of the road running to the dock on the Saguenay, west of the village, and about one half mile west of the site on the second terrace. It has been pecked to a nearly smooth surface on one side, but the opposite side has been only partly worked. The smaller end has also been only partly pecked into shape,

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[59] Moorehead, 1922, Fig. 61, specimens at left and right. There is also a specimen of this type from New Brunswick in the New Brunswick Museum, St. John (Cat. No. 6216).

but is not sufficiently constricted to hold the suspension cord. It is much longer and heavier than most objects of this class that the writer has seen.

Grooved Hammers. A few grooved stone hammers have been found near Tadoussac, some of them probably on the site of the second and third terraces.

One found by a resident and described to the writer by Dr. H. V. Ellsworth, of the Mineralogical Division, Geological Survey, was made from an oval pebble, round in cross-section, about 3″ long and $2\frac{1}{4}$″ in diameter, with a well-made groove around the middle. There is also a much larger specimen, said to come from Tadoussac, in the Museum of the Canadian Antiquarian and Numismatic Society, Chateau de Ramezay, Montreal. This is oval in cross-section ($5\frac{1}{8}$″×4″×$3\frac{1}{2}$″) with both ends flattened by battering. Still another specimen was found by another local resident.

The writer found on the surface of the third terrace an oval pebble of granite or gneiss, $4\frac{9}{16}$″×$3\frac{3}{16}$″×$2\frac{1}{2}$″, which seems to be in process of manufacture into a grooved hammer: it has what seems to be the commencement of a groove on one side (Pl. XXVI, B, *1*).

Whetstones. A small, thin rhomboidal slab of fine-grained sandstone, $1\frac{3}{4}$″ by $2\frac{3}{4}$″ in diameter and about $\frac{3}{16}$″ thick, with one face smoothed from use as a whetstone or polishing stone, was found on the surface of the second terrace, north of Tadoussac (Cat. No. VIII-E-627). It appears to have been larger at one time, for all the edges look as if recently broken.

A nearly rectangular slab of coarse sandstone (Cat. No. VIII-E-656) about 4″ by $2\frac{1}{2}$″ in diameter and about $\frac{7}{8}$″ thick, flat on both faces, found in Trench 1, second terrace, may have been used for the preliminary grinding of stone tools. Both faces are now quite rough, probably from sand erosion.

Objects of Unknown Use. There are several fragments of polished stone objects of unknown use. One of them consists of part of a much eroded, nearly cylindrical object of sandstone (Pl. XXVI, A, *2*), $1\frac{3}{8}$″ thick at the largest end and tapering to about 1″ at the other end. The large end had been rounded but is now partly chipped and broken.

A roughly triangular fragment of a slate or limestone object, $2\frac{1}{16}$″ long and $1\frac{3}{4}$″ wide, oblong in cross-section, found on the fourth terrace, Gauthier farm, looks like the wing of a bipennate type of banner stone (Pl. XXV, D, *13*). It slopes from the broken end, where it is $\frac{1}{2}$″ thick, to the tip where it is about $\frac{1}{8}$″. Both faces have been sand eroded, but the converging edges or sides are still smooth and even. A bipennate

form with wings of slightly different shape was found in a Red Paint grave.[60]

A fragment of a slate implement which tapers from a broken end, $1\frac{1}{16}'' \times \frac{9}{16}''$, to a rounded tip about $\frac{5}{8}''$ wide, is seen in Plate XXV, D, *12*. The sides are smooth and rounded and both faces are flattened and even. There is a longitudinal groove on one face, which may have been made after the object became broken to facilitate breaking into two narrow strips. This may be the upper part of a chisel-like implement. Speck considers it part of a lance head.[61]

There is a smaller fragment of what may have been an implement of the same kind as the last, which was found on the second terrace north of Tadoussac (Cat. No. VIII-E-614*c*). Both sides are rounded and smoothed from end to end, and both faces are flattened but not smoothed. The unbroken end has been ground to a dull point. It is about $2\frac{9}{16}''$ long, $\frac{7}{8}''$ wide at the widest end, and $\frac{9}{16}''$ thick.

Two other fragments of polished implements of uncertain use (Cat. Nos. VIII-F-614*a* and *b*), made of the same material, are from the same terrace.

Another enigmatic piece (Pl. XXV, D, *6*) is part of a hollow cylindrical object like a tube, for it is not likely to be part of a pipe bowl: it may be only part of a concretion, however.

Here also, attention might be called to two circular objects of fine grained sandstone or shale, $\frac{1}{2}''$ thick, found in Trench 1, second terrace north of Tadoussac. Unless they should prove to be some sort of concretion, they are unusual (Pl. XXV, D, *5*).

The irregularly ground piece of hematite seen in Plate XXV, D, *7*, may also be considered here, although it was evidently not intended for a tool. It was probably ground to obtain face paint.

SUMMARY OR CONCLUSION

The artifacts found on the surface and in excavations at these sites are made of stone and minerals only; no objects of bone and no pottery were found. They are of three different classes: the first, chipped, the second, rough, and the third, pecked, ground, and polished. Those of the first class consist of leaf-shaped blades of several different kinds, some of which, especially one that tapers more to the base than to the tip, are rare in other cultures; several semi-lunar blades; a few roughly rectangular blades; and several lozenge-shaped points. Only a few of the blades are stemmed and only one is notched. There are only a few that can be classed as arrow points. There are a few crude scrapers,

[60] Moorehead, 1922, Fig. 54, lower right.

[61] Speck, 1916, p. 431.

mostly plano-convex. A few other artifacts included in the chipped class are chisel-like, with one end ground to a sharp edge; one, an unusually fine specimen, is leaf-shaped, long, and thin. The objects of rough stone consist of percussion hammers, pitted hammerstones, grooved hammers, disk pounders, a possible mattock, and lap stones or anvils. The pecked, ground and polished stone artifacts include long, slender, lance-like points, mostly round in cross-section; a fragment of a broad slate spear or knife point, somewhat diamond-shaped in cross-section; adzes of four different kinds, one kind being long and slender, a few with the poll bent outward and others (unfinished) grooved and knobbed, the latter a widely distributed form; gouges, one of which seems to have been of the flaring type; chisels; an unfinished plummet; grooved hammers; whetstones; and a few objects of unknown use. There are many specimens in process of manufacture into adzes, most of them derived from spalls broken from small boulders; the waterworn surface of such spalls was retained for the humpbacked front of some of the finished adzes. A few of the unfinished forms are widest at the waist and may have been in process of transformation into grooved axes. Some of the artifacts, including some types of chipped blades, three types of adzes, two types of gouges, the percussion, pitted and grooved stone hammers, and the whetstones, are like those found elsewhere in Quebec and Ontario; but the most characteristic artifacts are the long, slender, punch-like lance points which have not been found in sites of other cultures in the east, but occur in Alaska and British Columbia, and the long, slender adzes, specimens of which have been found, but, rarely, in southwestern and northwestern Ontario, Nova Scotia, Connecticut, and Wisconsin.

It can by no means be said that, taken as a whole, the artifacts are crude. Most of the adz blades and lance points attest the mechanical skill possessed by the makers, and are as well finished as other artifacts of the same class found elsewhere in eastern Canada. It is true, however, that many of the artifacts of chipped stone are crude, but this in most cases is due to the poor quality of the material rather than to any lack of mechanical skill on the part of the worker. Some of the blades chipped from chert compare favourably with other specimens of the same class from other sites in eastern Canada; even one or two blades of quartzite show delicate marginal chipping. None of the objects is decorated, and none is perforated.

The absence of pottery is the most noteworthy feature of these sites and suggests that the culture is pre-ceramic. Bone artifacts were also absent.

The thousands of chippings, rejects, and unfinished artifacts, the

abundance of hammerstones at all of the sites, and the absence of camp refuse such as ashes or black soil, suggest that they are workshop rather than camp or village sites.

The people who worked at these sites may have arrived long before the pottery-using people whose shell heaps and inland sites are scattered here and there throughout eastern Canada. The fact that there are so very few artifacts like those used by the Eskimo makes it improbable that the people were proto-Eskimo, as some have suggested. Even though the similarities also are very few, there are more resemblances between the Tadoussac artifacts and those of the so-called "Red Paint" people of Maine, whoever they were, than between the Tadoussac and Eskimo. Both the Tadoussac people and the "Red Paint" people used the long, slender, "humpbacked" type of adz, knobbed adzes, plummets, and flaring gouges, and apparently had few or no small projectile points.

National Museum of Canada
Ottawa, Canada

BONE IMPLEMENTS FROM SHELL HEAPS AROUND FRENCHMAN'S BAY, MAINE

WENDELL S. HADLOCK

THERE are several hundred known shell heaps, along the coast of Maine, some of which have been hardly dug into while others have been completely excavated. Except for their size, they appear much alike both on the surface and in their internal structure.

It is not possible to say with certainty that one tribe or group of Indians inhabited each shell heap from the time of its beginning until the heap reached its present size. It is probable that many of the shell heaps were not, in many instances, occupied year after year, while others show a continual growth without any marked indication of periods when the areas were not in use.

Up to the present, we have no way of ascertaining the age of the shell heaps. We can roughly determine the age of the upper strata, as white man's tools have been found in them in some instances. The lower strata of some of the large shell heaps were probably the camping grounds of pre-pottery or archaic groups of Maine Indians. This pre-pottery horizon is not found in all the shell heaps and seems to indicate that some of the sites are older than others.

Of the many reports written on the archaeology of Maine, there has not been a complete analysis of the bone artifacts taken from the many shell heaps excavated. Because of the more or less haphazard methods of excavation and the incomplete notes kept at the various digs, very little information, if any, has been gained considering the stratigraphy of these camping sites or the chronological age of the artifacts found. It has been only recently that uniform methods of excavation have been attempted and complete records kept. In the past, only a few of the many shell heaps dug into have been completely dug out, while most of them have been only scratched on the surface. In spite of this incompleteness, reports have been written which were intended to give an adequate picture both of the camping grounds and their artifacts.

More nearly complete excavation might have led to other conclusions and have gained a more complete picture of the inhabitants.

The hypothesis and conclusions concerning the bone artifacts of Maine arrived at here may be changed when more detailed work has been done. I have not been able to find any reports which link the Eastern Woodland Indians with Eskimos of the Hudson Bay Region or of southern Greenland. Yet some of the bone artifacts show definite influence from these northern cultures; here again, however, the lack of material prevents a complete picture.

Shell heaps were inhabited by the Indians of Maine for certain months of the year before the arrival of the white man. They are made up mostly of shells, but no two are similar in their stratification although they are made up of the same elements: horizons of beach gravel, fire dirt, crushed and whole shells, and humus. In most instances, the narrow bands of gravel, fire dirt, crushed shells, and black humus merge into the larger horizons of whole shell.

It appears that the thick horizons were used as dumps while the smaller bands, which are made up mostly of beach gravel and fire dirt,

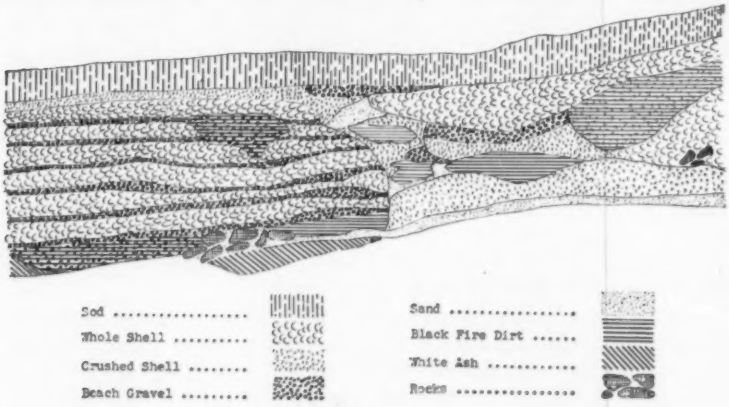

FIG. 31.—Cross-section of typical large shell heap, Maine.

indicate camp sites or the floors of huts. Most of the artifacts have been taken from the thin strata of beach gravel, fire dirt, humus, and crushed shells, but occasionally one of the large strata has yielded numerous, or various, artifacts.

Many of the smaller heaps are made up of only one or a few horizons, while the larger ones may have as many as fourteen or more horizons each in turn merging into deeper deposits of unbroken shells. It is not possible to trace these horizons through the entire area of the heaps, as in many instances they do not cover an area larger than a few square feet, apparently showing camp sites used by the Indians at various times throughout the life of the heap. The large, narrow horizons were also the sites of their huts but in addition must have been walked upon very extensively.

Fire pits have been found throughout the shell heaps, but in most instances they did not go down into the glacial clay. Fireplaces which

have been stoned were found in sections of all shell heaps, frequently in the lowest horizons. The rocks were set in the glacial clay and it appears that other rocks were placed upon them as the level of the shell heap rose. That these fireplaces were not in constant use is evidenced by the fine bands of crushed shells found in all of them at various levels.

In many of the reports of camp sites and shell heaps from other New England states, mention has been made of refuse pits. It does not appear that we have what could clearly be defined as a pit where refuse alone was deposited in any of the shell heaps that I have worked in Maine. Many of the large fireplaces contain refuse made up of animal bones, potsherds, broken bone and stone implements, but at the time these places were used as refuse pits, they were also used as fireplaces as most of the bones and stones were fire burnt.

At the Robert Abbe Museum, we have about one thousand harpoons ranging in size from those less than two inches long to many-barbed eighteen-inch harpoons. Many of these harpoons appear never to have been used, while others are broken to such an extent that it is impossible to tell their original size and shape. For the most part, all types of harpoons seem to have occurred in all shell heaps throughout the various horizons, but occasionally a certain type would only occur in one shell heap on one level. These implements which were unlike any of the other harpoons were not numerous.

The Tranquility Farm shell heap yielded four harpoons, the smallest of which was twelve inches, and the largest eighteen inches long. These implements had from six to eight barbs and were unlike any of the others in the Museum in that they were much larger and their barbs were very broad (Fig. 32, *1*). Each of these implements was broken at the hafted end and does not appear to have been perforated. They were probably shafted and used as spears upon which the game was impaled and brought to the surface without the shaft becoming detached.

These implements were found within twenty feet of each other and were all in the same horizon. They were found in the first stratum of beach gravel, fire dirt and crushed shells, about a circular pattern of fireplaces, the rocks of which were set in the glacial clay at the bottom of the shell heap.

One large type of harpoon (Fig. 32, *2*) occured in all the sheli heaps excavated by the Robert Abbe Museum.

Harpoons made of antler had generally two or three barbs and were perforated at the hafted end, indicating that they were used in the harpooning of the large sea fish and mammals abounding in the waters of Maine. Willoughby mentioned such a harpoon from a shell heap in

Connecticut.[1] These implements do not seem to be confined to any one stratum of the shell heaps as I have found them in the lowest horizons of the Taft's Point shell heap and at various levels of the Ewing and Bragdon shell heap. They have also been found at various levels in shell heaps about Frenchman's Bay.

Another type of large harpoon (Fig. 32, *3*) varies in the number of barbs from three to as many as six, but is not perforated. These likewise are not confined to any given stratum and are reported as common in New England shell heaps.

Many harpoons, ranging in length from two to six inches and having two or more barbs (Fig. 32, *4*), are cemmonly known throughout the shell heaps of New England. They are not perforated, which seems to indicate that they were used for smaller fish, such as salmon and trout. These implements were made from the leg bones of animals such as deer and moose.

A great variety of single barbed points (Fig. 32, *5*) which were evidently used as spear points in spearing fish have been found throughout all strata of the shell heaps. It has been noted, however, that the larger types are found in the lower halves of the deposits, while those in the upper strata are much smaller. Some of these smaller ones are so delicately made that they do not seem to be practical for fishing purposes. It is very probable that they may have been used in the weaving of mats. These small implements have a much longer shank and do not have any markings indicating that they may have been hafted. The barbs of these implements are very small and lay close to the shank itself (Fig. 32, *6*).

One harpoon which is not similar to any of the others at the Robert Abbe Museum is shown in Figure 32, *7*. It was found in the Ewing and Bragdon shell heap in a two-inch band of crushed shell and beach gravel on the outer edge of a fireplace twenty-two inches down from the top soil and up nine and three-fourths inches from the glacial clay. This implement seems to be similar to harpoons found in Greenland. As the hafted end is broken it is impossible to determine the probable method by which it was attached to the harpoon handle.

A great variety of implements, barbed on both sides and similar to those shown in Figure 32, *8* and *9*, have been taken from all shell heaps in the New England states and the Maritime Provinces. These implements are in various stages of preservation, some appearing to have been subjected to very extensive use while others appear never to have been used at all. They are more commonly found throughout the upper

[1] Willoughby, 1935, p. 214. Bibliography see pp. 361–362 following.

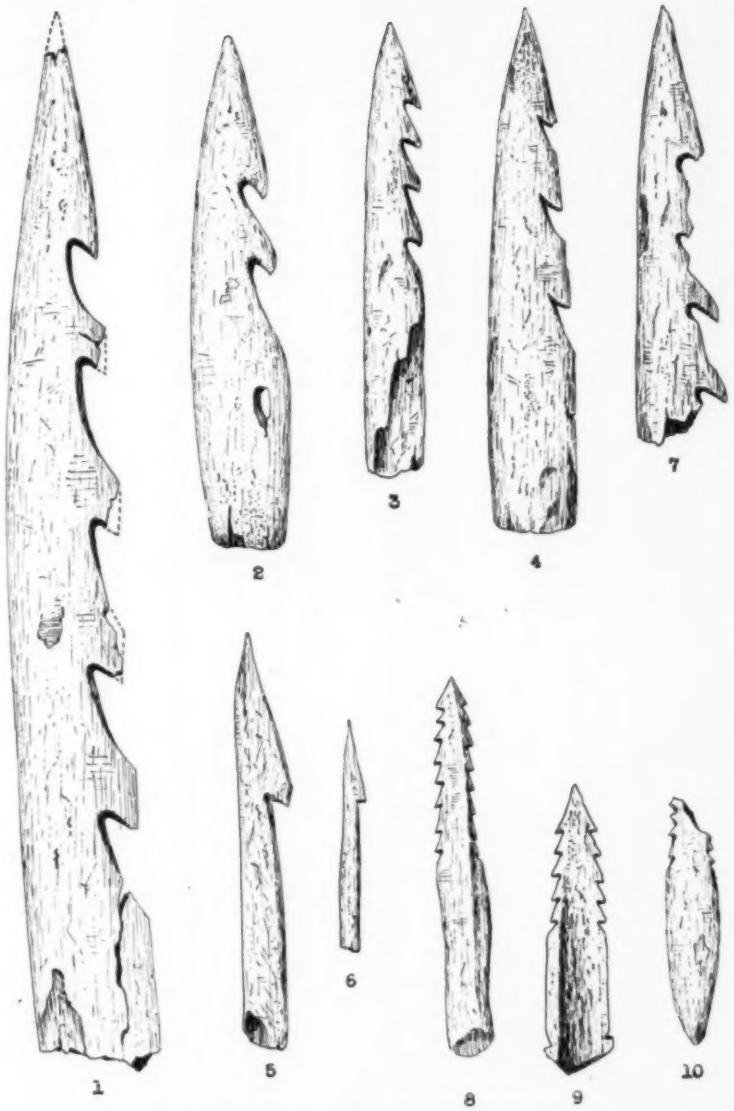

FIG. 32.—Barbed bone points, Frenchman's Bay, Maine.

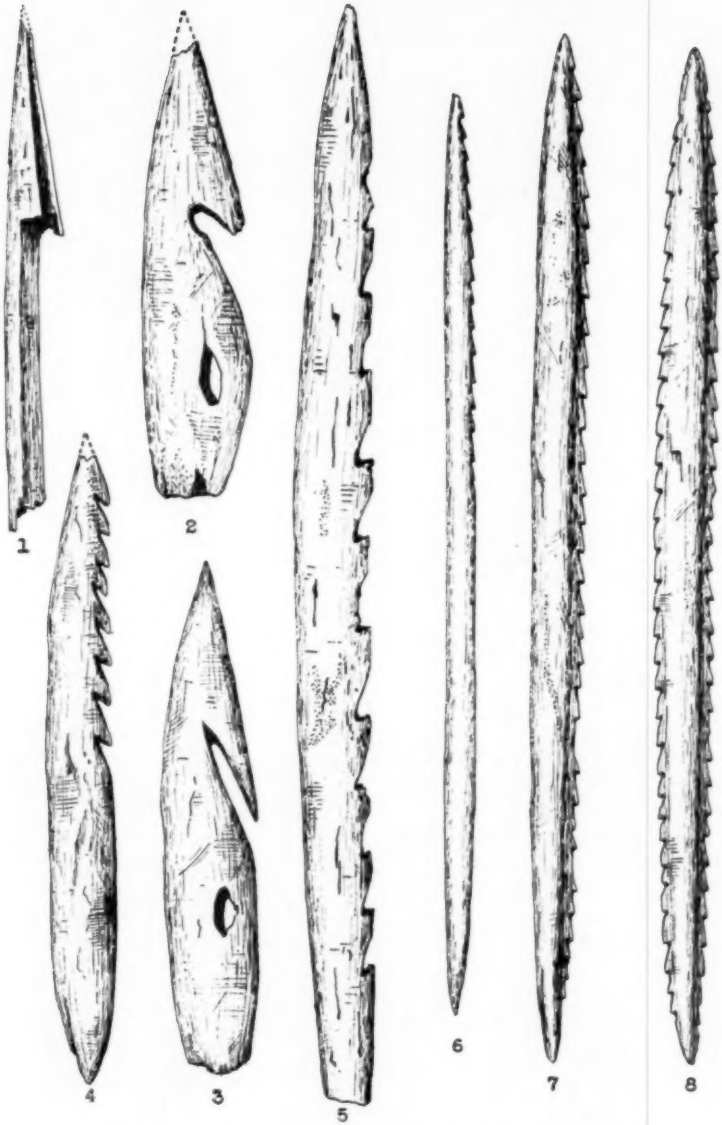

FIG. 33.—Barbed bone points, Frenchman's Bay, Maine.

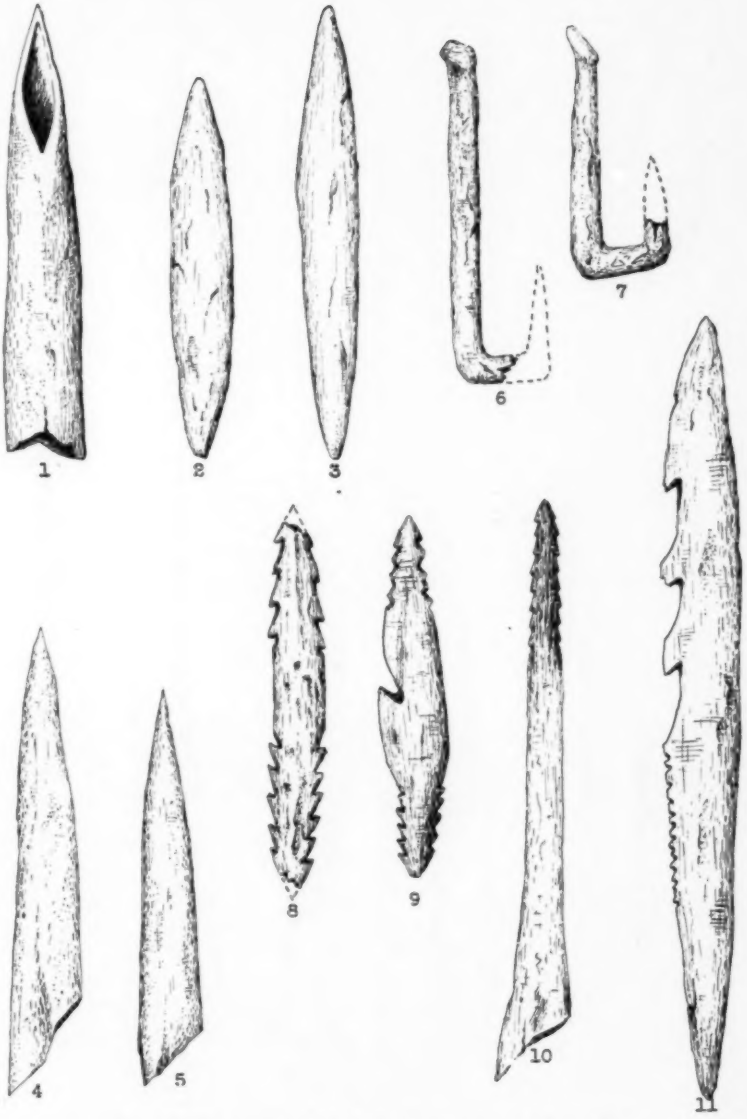

FIG. 34.—Bone points and fish hooks, Frenchman's Bay, Maine.

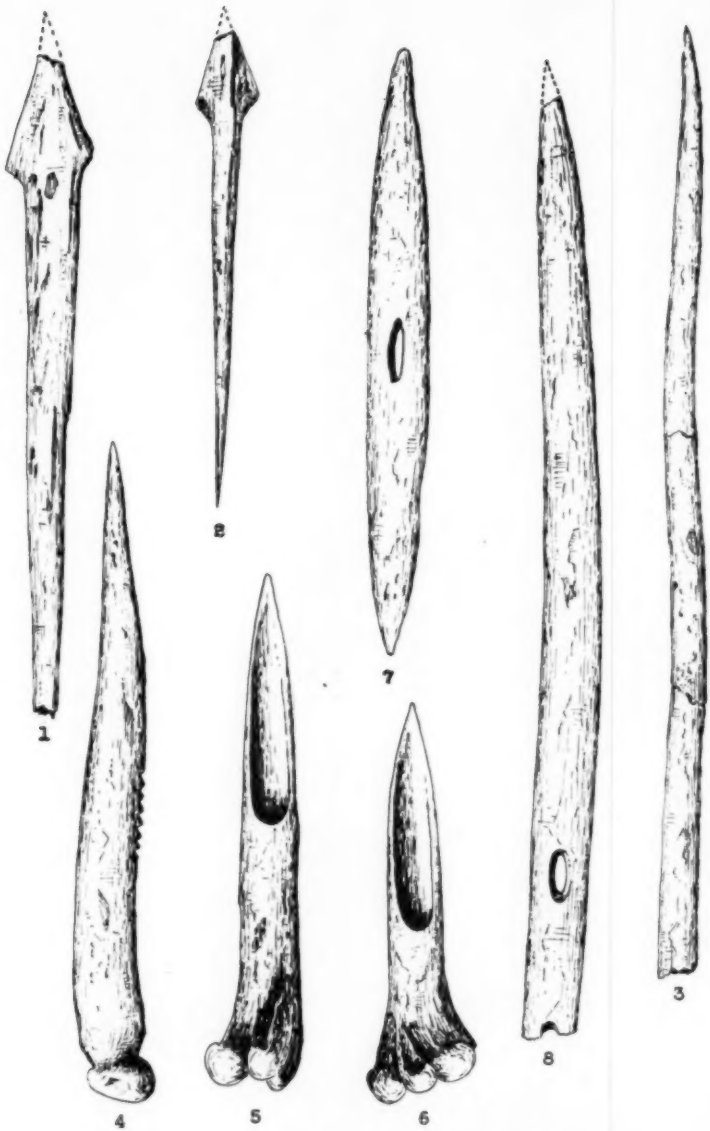

FIG. 35.—Weaving and sewing implements, Frenchman's Bay, Maine.

half of the shell heaps, but occasionally one may be uncovered in the lower half. It would appear from their construction, from the great number that were broken, and the way in which they were broken that they were used as arrow points. Often times only the hafted end (Fig. 32, *10*) has been found, which would indicate that the implement broke upon impact. These implements do not conform to a certain set pattern, but may have only one barb on each side or as many as eight to ten. It is very probable that they were used in the hunting of small animals such as beaver, otter and fox. Early descriptions of this region tell of the use of bone arrow points for the hunting of small animals and water fowl and for the shooting of fish at low tide.

One type of harpoon point (Fig. 33, *1*) appears in all shell heaps excavated by the Robert Abbe Museum, but is not common. This implement has two barbs which project from the same side of the shaft, but which are at an equal distance from the point. In all instances, they were made from the leg bones of animals such as deer and moose. It appears that one large barb was made and then this barb was split down the middle and the center section cut away forming two barbs close together. They are of the smaller type of bone points and are found in the lower horizons of the shell heaps.

The harpoon most commonly found in all the shell heaps of the New England states and Maritime Provinces is shown in Figure 33, *2*. It varies in length from two or three inches to as much as six or seven inches. In all instances, it has a single barb which is deeply cut and stands well away from the axis of the shaft. In only one instance, have I found a single-barbed harpoon which had its barb lying close to the axis of the shaft (Fig. 33, *3*). These implements are perforated, showing that they were attached to a line. This type of implement was commonly used by all the Indians who built the shell heaps.

Implements which present a problem in determining their probable use are shown in Figure 33, *4* and *5*. The former is like other harpoons except that it is much more slender, and in most cases has from eight to as many as fifteen barbs which are not very deeply cut. As this type of implement is so slenderly constructed, it leaves one at a loss to determine what practical use it could have served. From the construction of its hafted end, it would appear that it was attached to a shaft and used very much as a spear. These implements are rarely found unbroken and in a perfect state of preservation.

Implements such as the one shown in Figure 33, *6*, are made from thin long shafts of bone, not generally over one-fourth of an inch in diameter. The barbs, which are nothing more than serrations cut into a small raised ridge on one side, do not as a rule extend more than half

of the length. Two implements (Fig. 33, *7* and *8*) are very similar in construction except that the serrations or barbs are on both sides of one implement and are to be found only on one side of the other. Such implements have been mentioned in various reports as tines on three-pronged spears for flounders or for birds; similar implements are used for the latter purpose by the Eskimo. They have been found in all of the shell heaps about Frenchman's Bay and have been reported by other writers as occurring in other shell heaps in Maine. We have found them to occur only in the upper strata of the shell heaps, but it is possible that due to their frail construction those left in the lower strata deteriorated so that they seem no longer present.

Various points made from the leg bones of birds occur in the shell heaps throughout the levels, but more frequently in the lower levels. These implements (Fig. 34, *1*) may have been used as arrow points. Only one antler point has been found which might have been used in this way.

The most numerous bone objects of the shell heaps of the New England states (Fig. 34, *2* and *3*) present a problem in that no one has come forth with a definite conclusion for their probable usage. They seem to have been common to all inhabitants of the shell heaps and were very extensively used. As many of them have been broken, it might appear that they were used as arrow points in the hunting of small game.

Numerous bones (Fig. 34, *4* and *5*) fit Champlain's description of the bone fish hooks used by the Indians whom he saw fishing in Massachusetts Bay; he further states that these sharpened bone points were inserted into other pieces of bone which had been cleft at one end and that they were securely held in place by a thong. Others (Fig. 34, *6* and *7*) could only have been intended for fish hooks: they were found in the Jones Cove shell heap and are not commonly reported from other shell heaps. The slender bone barbs are, however, very numerous in all the shell heaps that the Museum has excavated and are not confined to any one stratum.

Objects which may have been used as awls are shown in Figure 35, *1* and *2*. They are so frail that one is led to conclude that they were used in making holes in light materials. They appear to have been attached to a handle. They are not numerous in the shell heaps and are not confined to any one stratum.

Long slender bone objects which show but little work beyond cutting from their sources (Fig. 35, *3*) were numerous in the Tranquility Farm shell heap, but have only been found singly or in pairs in the other shell heaps about Frenchman's Bay. Except for the fact that they are all fashioned on the same pattern, one would not take them for any thing but a long sliver of bone which had been broken from a larger

bone. As they are not barbed and do not appear stout enough to have been used as awls, I have called them aids in weaving and have put them with the rest of the weaving and sewing artifacts.

Awls, or perforators, are abundant in all levels, but only a few are unbroken. Figure 35, *4 – 6*, shows a few of the complete awls, made from the leg bones of moose, deer, and birds, which have been found by the Robert Abbe Museum. A few have been found which were made from the tines of antler, but in most instances they were broken.

Other sewing and weaving aids are shown in Figure 35, *7* and *8*. The latter is an example of the longer slender type of perforated bone bodkin used in weaving. These implements are common in the upper half of the shell heaps and are occasionally found in the lower strata. It is thought by the writer that due to their construction they were not preserved in the lower strata. The double ended bodkins, or shuttles, which have a small hole in the center are not numerous in any of the shell heaps excavated by the Museum, but have been found in all of the camp sites. They are not confined to any one level but may be found only in the lowest horizon of one shell heap while they may occur only in the upper levels of another. From their construction it appears that they were used as an aid in weaving snow shoes (Fig. 35, *7*).

Small bone needles have not been reported from many of the shell heaps of Maine. Other than those reported from the Taft's Point shell heap, the only others I know of were taken by Johnson and Byers of Andover from the Nevin shell heap. As all of these needles have small eyes, they must have been used in sewing on very fine work. Those taken from the Taft's Point shell heap were found beneath a ten-inch layer of broken shells in the outer edge of a fireplace. All of them were made from the spines of sculpins.

Flakers of bone and antler have been brought to light in all the shell heaps. These implements vary in length from two to six inches and may have their flaking ends fashioned in various ways as shown in Figure 36, *1*.

Bone handles with a small groove in one end have been found in the Tranquility Farm and Ewing and Bragdon shell heaps. They had at one time a small copper blade inserted in the groove and held in place by a thread of some sort. All the handles were copper-stained on the grooved end, but in only one instance have we found the blade with the handle. These implements were found on the lower horizons of the shell heaps, with other copper artifacts such as beads. Such an implement (Fig. 36, *2*) could have been used to good advantage as an aid in opening clams or other shell fish, as it is small and has a very thin blade.

A great many beaver teeth showing artificial resharpening in such

a fashion as to give a long cutting edge have been found in the shell heaps of Maine. These implements may have been used in carving, or in making decorations on pottery. Some of them are recut in such a fashion as to indicate that they also were used as clam openers. Figure 36, *3–5*, shows some of the ways in which these teeth were resharpened. They have been found in all levels of the heaps and are, as a rule, very well preserved.

Bone combs have not been reported from any shell heaps other than those of the Frenchman's Bay region where three were found (Fig. 36 ~~35~~, *6–8*). All combs are decorated on both sides, and are so frail that the teeth have decayed and broken away, leaving only the upper portions intact. They were taken from the upper horizons of the shell heaps only a few inches under the sod area. Objects manufactured by the white man have been found in the sod or disturbed area of both these shell heaps.

Bone ornaments of various designs have been taken from most of the shell heaps of Maine. By far the most numerous are the hollow bone beads made from bird bones. These cylindrical beads have been found in the shell heaps excavated by the Robert Abbe Museum and in most instances they were found in the lowest horizons. They are made of small leg bones which have been cut into lengths of about one to one-and one-half inches; in most instances, the cut edge of the bone has been rounded and smoothed over.

In the excavations carried on by the Museum, only a few small, disk bone beads have been found. They come from various levels and cannot be classed as characteristic of any one stratum. We have in the museum a string of these beads taken from the upper horizon of a shell heap a few inches under the sod area.

Bone pendants or charms which were so fashioned that they might be suspended about the person occur in all the shell heaps, but here again they are so few that little, if any, information may be gained from them. Figure 36, *9*, shows a bone object, notched and perforated, which is our best example of this work of the Indians. It came from the Tranquility Farm shell heap, fourteen inches down from the sod area in a black band of fire dirt, crushed shell, and beach gravel.

Teeth, perforated or notched for suspension, have been found in all levels of the heaps, but over 70 per cent have been taken from the lower levels.

Two bone objects (Fig. 37, *1* and *2*) appear to be scrapers used in fleshing of hides. Both have edges which are fairly sharp and both are shaped somewhat like the blade of a drawshave. They could have been successfully used as scrapers on hides which had been placed on logs.

One (Fig. 37, *1*) was made of a leg bone of a moose, cut away on one side, from which the marrow had been removed. Decorations similar to those shown are on all three sides. This implement was found in the Hall shell heap in a horizon of beach gravel, fire dirt, and crushed shells, eighteen inches down from the sod area. The inside was caked with grease and ashes. The other flesher was a large sliver of moose bone worked down from one-half inch in thickness on the back to a very thin cutting edge. It was decorated only on one side and on the narrow back which was incised with fine lines forming an × pattern. Another implement similar in shape to this, but smaller and without any decorations, was found in the same, lowest stratum of black fire dirt and beach gravel of the Tranquility Farm shell heap about twenty-five feet distant from the other.

Figure 37, *3* and *4*, shows two types of bird calls or musical instruments taken from four of the shell heaps in the Frenchman's Bay region. Six bone flutes or bird call implements were taken from the upper strata of the Ewing and Bragdon, and Tranquility Farm shell heaps. The three from the Ewing and Bradgon shell heaps were similar to the one figured (Fig. 37, *3*) except that one had four small stops instead of three. Two such implements were also found in the upper strata of Tranquility Farm shell heap, while a third, two inches long and shaped very much like a small willow whistle without any reeds or stops, came from the lowest horizon of beach gravel and fire dirt (Fig. 37, *4*). As these hollow bone implements occur in various shell heaps of this region and are not confined to any one stratum, it would appear that they do not indicate a new or strange culture.

Projectile points made from the sword of the sword fish have been reported from various shell heaps of Maine. Those found by the Robert Abbe Museum were in a very poor state of preservation. Most of them have been taken from the lowest horizons of the shell heaps. Johnson and Byers found many pieces of sword fish sword, which had been worked, in the Nevin shell heap in Bluehill. The Nevin shell heap has given up more of these artifacts than any other shell heap excavated in Maine. Those taken from other shell heaps are not numerous enough to be considered characteristic of any given stratum.

Occasionally, small bone implements which appear more like darts than any other type of hunting implement have been taken throughout the various horizons of most of the shell heaps of Maine. Figure 34, *10*, is the best example of such an implement. It was taken from the Taft's Point shell heap and, as in many other implements of its kind, the barbed end seems to have been tempered by heat.

All the shell heaps have yielded miscellaneous bone artifacts. A

few of these are shown in Figure 34, *8*, *9* and *11*. The double barbed implements may have been used as fish hooks: both ends may have been baited and the line attached about the middle. Other implements (Fig. 34, *9* and *11*) seem to be nothing more than elaborate improvisions of small harpoon or spear points. They are not confined to any one area or stratum so here again it would seem that they are not of a new or strange culture but are the product of some inventive mind.

In all the shell heaps there have come to light many worked bone fragments. By far the greatest number of these appear to be knuckle bones and the tarsus or toe bones of deer and moose. These bones seem to have been used as containers for mixing war paint as all of them are coated on the inside with thick layers of grease which had been mixed with lamp black; one contained a small quantity of red ochre. These bones have been reported from other shell heaps and Willoughby found several toe bones which had been used in some game. It is possible that these worked bones were not in all instances used as paint pots, but that the hole was made so that the Indians could extract the marrow. These are the only bones which appear to have been worked for the sole purpose of extracting marrow and then used as containers of some sort.

A large projectile point (Fig. 37, *5*) was taken from the middle horizon of whole and broken shells of the Tranquility Farm shell heap. It is the only one of its type thus far brought to light in the Frenchman's Bay region. Other bone projectile points of this region are fashioned with a straight stem but one, Figure 37, *5*, has deep notches at the base which is grooved so that the shaft will fit more closely to the head; it is made of whalebone and is similar to points used by the Hudson Bay Eskimos. It is, we believe, the only one of its type reported from Maine.

Small projectile points or arrowheads fashioned from bone have been found in many of the shell heaps and do not seem to be confined to any one stratum. For the most part, they are very similar in shape and all appear to have straight stems.

The small implement shown in Figure 37, *7*, is very finely fashioned and the serrations on the sides are very distinctly and neatly cut. It appears that this implement had at one time a longer cutting edge like that of an awl. It is impossible to say for just what practical purpose it could have been used and here again we must list it among problematical implements.

Only one bone chisel with a handle fashioned to fit the fingers of the hand has been found by the Museum (Fig. 37, *8*). Other bone chisels have been found but none as completely finished as this. It is very probable that such implements were used as skinning aids. They are not confined to any one stratum of the shell heaps and, although not numerous, do occur in most of the shell heaps of Maine.

In only a few of the shell heaps of Maine has a pre-pottery horizon been reported although such a horizon has been reported in New York State in several localities.[2] The artifacts from these sites are very similar to those taken from the larger shell heaps of Maine. At this time, I think it might be well to state that most of the small shell heaps seem to be of a later date than those which reach a depth of three feet or more. There may be exceptions to this, however, as in the case of the Nevin shell heap dug by Johnson and Byers, where much of the material was very similar to the bone work of the lowest strata of the large shell heaps. Not all of the large shell heaps have a pre-pottery horizon, but in such cases these shell heaps cover a large area and do not have a great depth in any one given place.

Except for the pre-pottery horizon in some of the shell heaps, we find that the artifacts of shell heaps compare very favorably with one another in regard to their relative position in the sites and as to their size and fashion. It has been noted that with the exception of a few artifacts, they can be fairly easily followed up through the various horizons of the shell heaps and from their size and construction, their position in the shell heaps can be nearly ascertained. This is not true of all the artifacts, as certain ones were used throughout the entire history of the camping ground, but others seem to be introduced in certain horizons.

The introduction of new articles does not, to my mind, mean the occupation of the site by a new culture, but rather the advancement of new ideas gathered by the Indians of Maine from observation of the types of tools used by Indians of other regions. If these new tools were a radical departure from other types and were not found with other artifacts of similar type and manufacture, one would conclude that, due to negative evidence of other artifacts, these implements were brought in or manufactured by some person who had had contact with some distant tribes which commonly manufactured such implements. The knowledge of such implements by the Indians of Maine does not necessarily mean direct contact with the distant tribes, but may have been gathered through trade or learned from captives.

Willoughby credited the shell heaps of Maine to the Old Algonkian, the Algonkian group in general and the Late Algonkian. It is not perfectly clear how he arrived at the classification of these groups. In most instances, the artifacts of all groups cannot be segregated to any one definite stratum or section of the shell heaps. Except for the very first level or stratum in some of the larger shell heaps, there does not appear to be much of any change in cultural differences. The first strata of the

[2] Skinner, 1920, pp. 125–218.

larger shell heaps lack pottery, and artifacts in these levels compare favorably with such artifacts taken from the pre-pottery levels from New York.[3] In recent reports from New York State more evidence of this Archaic pattern has been found.[4] The artifacts of the Archaic pattern, chipped stone implements, beveled adzes, plano-convex adzes, bone awls, double-pointed implements, bone beads and fish hooks are very similar to those taken from the pre-pottery horizons of the shell heaps excavated by the Museum. This pre-pottery horizon has been found from the coast of New York as far north as Labrador and, whereas many of the artifacts are not similar in shape and manufacture to artifacts in the upper horizons, others seem to have been used throughout the entire life of the shell heap.

This would not indicate, to my mind, that the Archaic culture had become extinct, but rather that its bearers had learned new methods of manufacture; the shell heaps show nothing more than progress in developing new ideas in tools and their manufacture.

In all the shell heaps worked by the Museum, artifacts similar to those of the so-called Red Paint culture of Maine have been found throughout the numerous levels. In most instances they were in a poor state of preservation and all showed evidence of extensive use. The presence of these artifacts in the shell heaps shows that the inhabitants were familiar with their use and manufacture, and these implements are not of culture other than that of the Eastern Woodland Indians.[5]

Pottery is associated with all of the bone implements: pottery of archaic Algonkian in the lowest pottery horizon and later Algonkian, some of which showed Iroquoian influence, in the upper horizons. Here as in the case of the few unusual bone artifacts, the pottery showing the Iroquoian influence is very meager, and does not seem to indicate a period of occupation by Iroquoian Indians. The types of bone artifacts do not change or show the influence of Iroquoian culture.

From the bone artifacts and their associations, it appears that the shell heaps excavated by the Robert Abbe Museum are not the products of many cultures, but are in reality the old camp sites of the Eastern Woodland Indians from their first advent into Maine up to the arrival of the white settlers. It is logical to assume that during this period of occupation, which may have covered a very long time, the Indians changed their methods of hunting and the types of tools used. This would account for the relative lack of types of artifacts in the lower horizons, and the diversity of artifacts gradually entering in the middle horizons and increasing until the shell heap reached its present state.

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[3] *Ibid.* [4] Ritchie, 1936. [5] Hadlock, 1941.

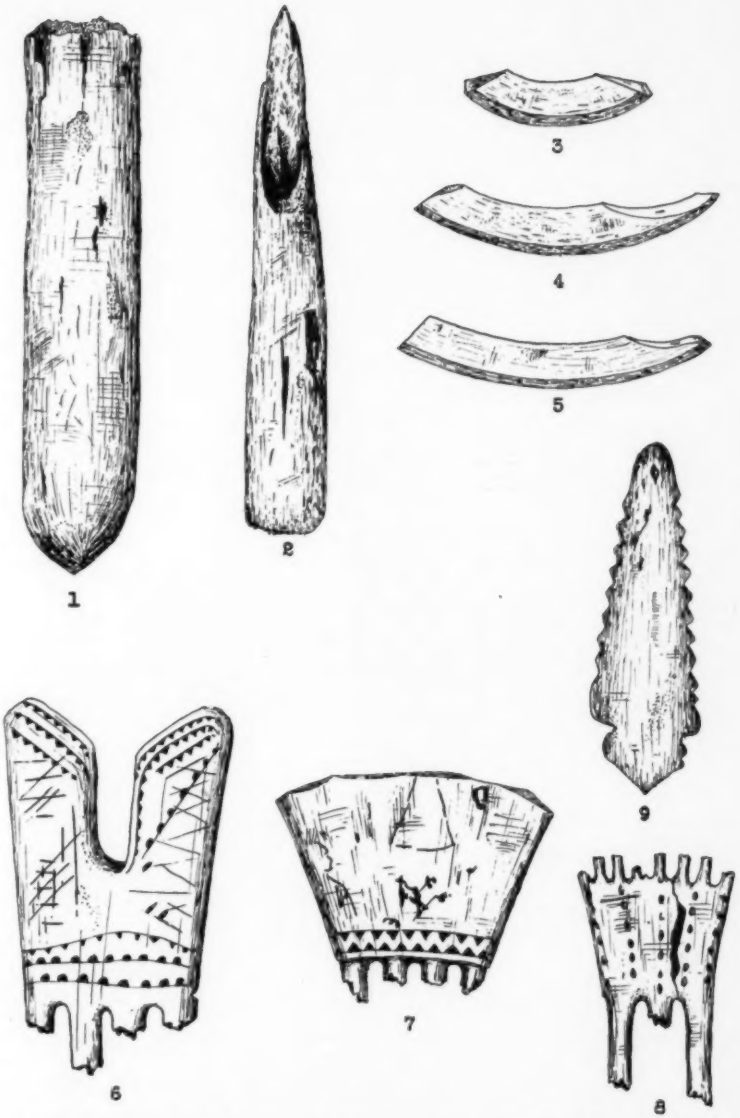


FIG. 36.—Bone artifacts and worked beaver teeth, Frenchman's Bay, Maine.

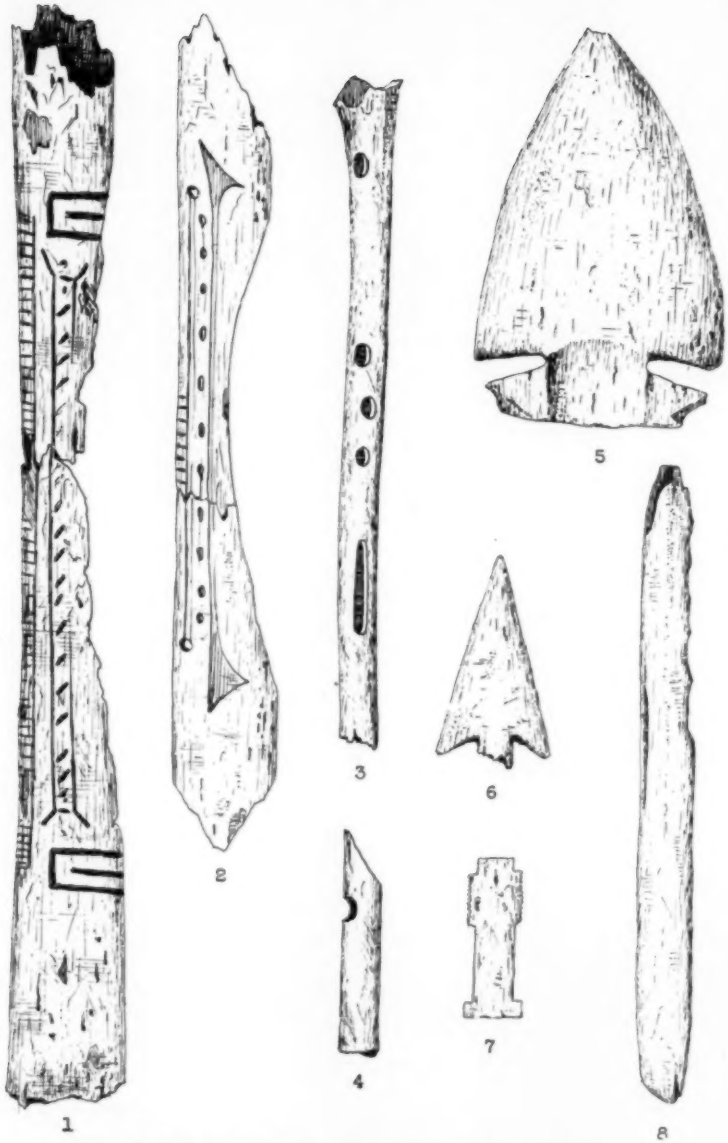


Fig. 37.—Bone artifacts, Frenchman's Bay, Maine. *5*, whale bone.

It would appear from the size of these shell heaps that they are the products of a great many years by a few Indians or of a few years by a great many Indians. In the early sixteen hundreds the Jesuit Fathers wrote that there were not over three thousand Indians in what is now the State of Maine. As there are a great many of these shell heaps along the coast of Maine, many of which are very extensive, one is inclined to believe the Indians had occupied them many hundreds of years ago. A description of the mode of life, at the time of the advent of the French to these shores, by the earliest explorers and Jesuit Fathers gives a very good insight into the types of artifacts used, their hunting habits, and the way in which their food was prepared. Such descriptions compare favorably with the artifacts found in the upper levels of the shell heaps.

Until excavations which will give us a more definite date on the artifacts of the lower horizons are completed, there is no way in which the shell heaps may be dated. Excavations carried on in adjoining states have revealed cultures which were very old, and a comparison of the artifacts taken from the Maine shell heaps with these known collections reveals a remarkable similarity.

Robert Abbe Museum
Bar Harbor, Maine
January, 1942

ANIMAL TOOTH IMPLEMENTS FROM SHELL HEAPS OF MAINE

E. E. Tyzzer

THE wide utilization by primitive peoples of animal teeth for implements as well as for ornamental purposes is too well known to archaeologists and ethnologists to require further comment. The object of the present paper is to describe and classify those types of rodent-tooth implements found locally, to discuss the method of manufacture and to present evidence as to the grinding of the canine teeth of various carnivores in all probability for utilitarian purposes. The material upon which this study is based has been collected by the author from several sites on or near Naskeag Point, Brooklin, Maine, chiefly from a single shell heap on Harbor Island. From various reports consulted and from such museum collections as have been examined, this material appears to be fairly representative of much of the Maine coast, and, according to Smith and Wintemberg,[1] of shell deposits in Nova Scotia as well. Rodent-tooth implements occur with great frequency and in the sites investigated unworked beaver incisors are seldom found.

RODENT-TOOTH IMPLEMENTS

Both the lower and the upper incisor teeth of the beaver and the lower incisors of the porcupine, the muskrat, and, according to Wintemberg, the woodchuck, have been utilized. Moorehead[2] mentions several hundreds of beaver teeth sharpened as chisels from Maine shell heaps. The lower incisor of the beaver, in its natural state, is such an efficient cutting tool that it is not remarkable that such teeth are found with edges only slightly resharpened by grinding (Pl. XXVII, *1*). With continued grinding, the tooth is transformed from a shallow gouge to a chisel with a flat bevel and an edge which is curved on account of the convexity of the labial surface of the tooth. Thinner, less clumsy chisels, are made by scraping away the substance of the tooth along its inner curvature (Pl. XXVII, *4* and *5*) so that it is often reduced to a thickness of 3.5 to 4.5 mm (Pl. XXVII, *9* and *10*), while the proximal end is squared off by grinding. Many chisels are quite short (2 cm) and possibly represent those worn out by repeated sharpenings. To what extent the tooth is intentionally shortened in shaping chisels is not known although portions of teeth have been found broken transversely after being partially sawed through. The angle to which the working edge

[1] Smith, 1929.

[2] Moorehead, 1922.

is ground varies greatly, some chisels having thin edges, others sharpened at an angle of 45 degrees or more.

Lower incisors are also found that have been reshaped in no way except that cutting ends have been blunted (Pl. XXVII, *13–15*). The rounded end of this type of implement suggests, that it may have been employed in flaking, but this is purely conjecture.

Implements of a third type resemble chisels but have square or slightly concave ends. Plate XXVII, *17*, illustrates one with concave ends, but such ends may be convex in the plane perpendicular to the surface shown here. Implements of this type often taper from a thicker middle portion toward the ends, the surface of the latter sometimes showing a high polish. It would seem that such objects might serve for some sort of scraping process, the concave ends being adapted for work on cylindrical objects or convex surfaces. The specimen shown in Plate XXVII, *20*, has one extremity ground at an angle of less than 90 degrees and perhaps would rate as a chisel.

Gouges shaped from the lower incisors of the beaver are also found. These may be very thin (Pl. XXVII, *21*) or scraped to moderate thickness (Pl. XXVII, *22* and *23*) while in the form in the same Plate, *24*, the type of cutting edge of the original tooth is maintained. A combination gouge and knife is shown in Plate XXVII, *16*, the knife edge being below at the right.

Knives manufactured from both the lower and upper incisors of the beaver are of frequent occurrence. The most common type is made by scraping away the substance of the lower incisor on its side toward its distal end so as to leave an edge to the left on the outer curvature (Pl. XXVII, *33–36*). This edge is sharpened by grinding. The tip of this type of knife is usually pointed or rounded but the distal end of the tooth may be kept more or less intact so as to serve as a chisel or gouge in a combination tool (Pl. XXVII, *33* and *34*). In making this type of knife, the proximal end of the tooth is usually not squared off or modified in any way and the lower incisors are rarely split,

On the other hand, the upper incisors are almost invariably split for the making of knives, doubtless due to the fact that these teeth are hollow for the entire length.

The splitting is very neatly done leaving the outer enamel-covered (labial) surface intact, while not over two-thirds of the dentine is left supporting the enamel and extending along one side of the tooth. In none of the knives of this type are irregularities of the fractured surface removed by scraping, but a portion of the edge at the outer curvature is ground. The cutting edge may occupy the mid-portion of the tooth (Pl. XXVII, *31*) or lie towards either the proximal or the distal end.

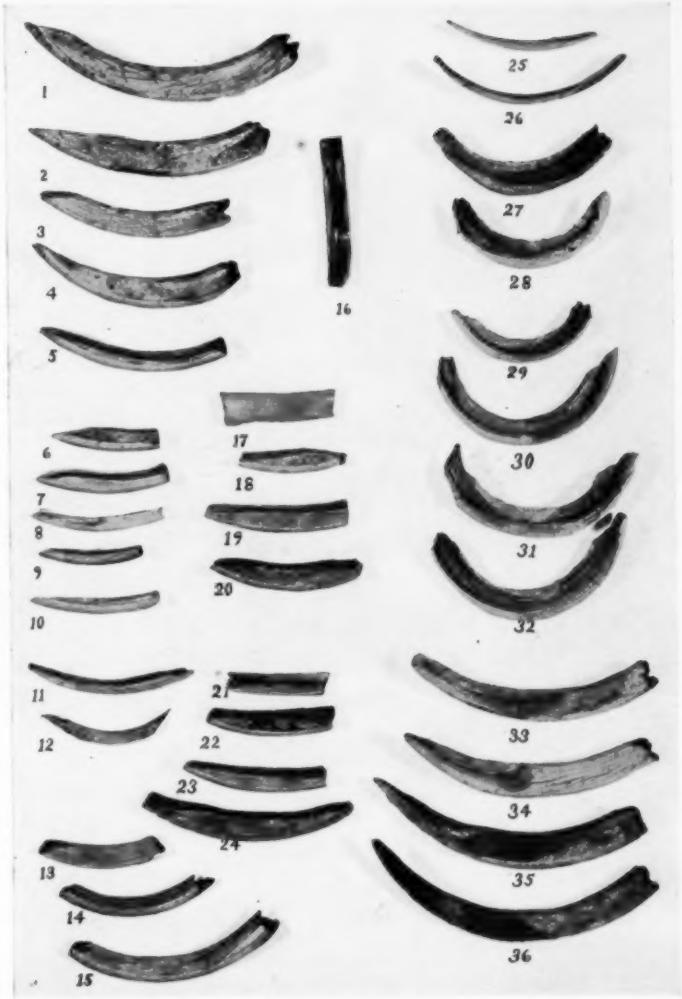
When the terminal portion is sufficiently ground down (Pl. XXVII, *27*), the knife resembles those derived from the lower incisors. In Plate XXVII, *28*, is a knife of this type evidently made for a left-handed person.

The knives represented in Plate XXVII, *25* and *26*, are of interest in that they resemble more closely than those of any other type the steel blades of "crooked" knives still used by various groups of eastern Indians. The knives in question are made by scraping the lower incisors of the beaver to a crescentic strip, in the examples shown only 2.3 mm in thickness, and consisting of a thin layer of dentine supporting the enamel. The dentine is beveled on each side to the edge of the enamel and an edge is ground, so that when turned toward the observer it extends from the left-hand extremity. Like the steel blade of the better examples of modern crooked knives, they are triangular in cross-section but do not conform wholly with the latter in that the bevel of the cutting edge is more obtuse than that of the back. If these implements were hafted after the manner of a crooked knife, owing to their greater curvature, the handle would extend at more of an angle to the blade than is the case with the modern steel-bladed type.

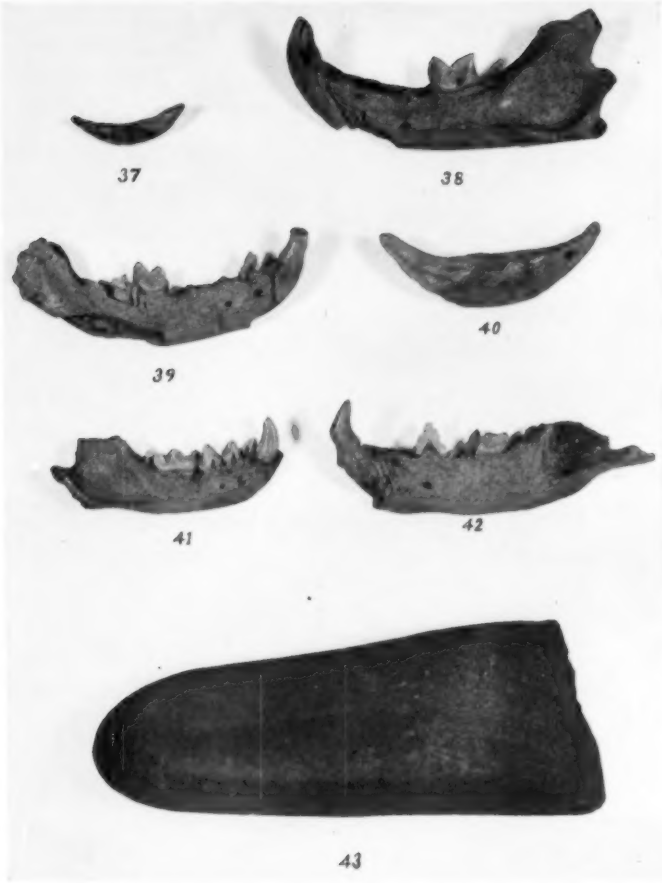
In addition to the beaver-tooth implements described, there are examples of the lower incisors of the porcupine scraped along the inner curvature and sharpened as chisels (Pl. XXVII, *11*) and also of a muskrat lower incisor with the edge retouched (Pl. XXVII, *12*).

A mode of hafting chisel-like implements made from beaver teeth is well shown in a specimen found in New Brunswick illustrated by Smith.[3] Attention is called by this author to the similarity of the antler handle to the wooden handle of the modern crooked knife. Skinner alludes to "beavers' teeth cut and ground to an edge that may have been used as chisels or primitive crooked knives or both, as they were until recently by some of the Eastern Canadian Algonkin."[4] It would appear that the thin blades of the last type in the series described in the present paper would correspond more closely than any other to the blade of the modern crooked knife. Nothing of the nature of handles for beaver tooth implements has been identified in the material from the Brooklin sites, but it would appear that the mandible was utilized to some extent as a handle. Thus the lower jaw of a young beaver was found, the left mandible of which had the incisor scraped to an edge on the outer side. In grinding this edge, the surface of the adjacent bone of the tooth socket was ground away. The bone of the right mandible of

[3] 1929, Pl. XX, Fig. 1.
[4] Skinner, 1909, p. 211.



Rodent-tooth implements, Harbor Island and Naskeag Point, Maine. *1–3, 12;* sharpened lower incisors; *4–11:* chisels; *17–20:* square- or concave-ended; *21–24:* gouges; *33–36:* knives, lower incisors; *27:* upper incisor knife; *28:* upper incisor knife, left-handed; *29–32:* knives, upper incisor with proximal or mid-portion sharpened; *25–26:* thin blades; *16, 33:* combination knife and gouge, gouge either at opposite ends or at distal section. *1–10, 13–36:* beaver teeth; *11:* porcupine; and *12:* muskrat.



Carnivore teeth showing ground surfaces and stone adapted to grinding of beaver knives, Harbor Island and Naskeag Point, Maine. *37:* fox, lower canine; *38:* bobcat, left mandible; *39:* fisher, right lower canine ground; *40:* wolf, lower canine, tip sharpened; *41:* extinct sea-mink, tip of canine and edges of anterior two premolars ground; *42:* otter, canine ground near border of enamel and at tip.

the same jaw was untouched but the tip of the incisor was ground to a square edge.

All the major shaping of the beaver tooth implements in the material at hand was done by a process of scraping with a rough-edged implement, as shown by the low ridges and shallow furrowing of the worked surfaces. No attempt was made to shape the surface by grinding, except that in making chisels the blunt end is squared off and ground smooth. However, the edges of the implements were sharpened by grinding as shown by the delicate parallel striae seen at low magnifications. These striae for the most part extend transversely to the length of the tooth, although implements with a lateral edge may show diagonal striae. A stone of a gritty composition was found at the Harbor Island site which had obviously served for grinding purposes. One end has been shaped by pecking and grinding so as to furnish a smooth, even, convex surface (Pl. XXVIII, *43*) which is perfectly adapted for grinding the lateral-edged knives already described. It is to be noted that the curved edges of none of these knives could have been ground on a flat surface. On the opposite face of this stone is a shallow longitudinal groove (not shown in figure) evidently produced by some sort of a grinding process.

EVIDENCE AS TO THE USE OF THE CANINE TEETH OF CARNIVORES AS IMPLEMENTS

The utmost caution is essential in the interpretation of minor ground surfaces (facets) on the exposed portions of teeth. On the other hand, such minor features may furnish the most convincing evidence of artificial grinding. It is well known that wherever teeth impinge one upon another with the motions of the jaws, facets form, also that adjoining worn surfaces may be at different angles due to variation in the position of the teeth as they are brought into contact. For example, the pointed cusps of the large lower molars and the opposing upper premolars of carnivores almost invariably show sharply ground edges where the upper and lower teeth slide by each other like the blades of scissors. Teeth may also be markedly dulled through usage: notably the canine teeth of bears, wolves and dogs commonly show their tips chipped and dulled. Most remarkable changes are seen in teeth of otters in which the canines are not only commonly dulled or worn flat, but all the small teeth of the anterior portion of the jaw may be worn to mere stubs. Presumably such changes in otters' teeth are due to the character of their food or their manner of feeding, for their teeth appear to be quite as hard as those of other native animals.

In interpreting facets upon teeth, it should be taken into account that the hinge-like character of the articulation of the lower jaw in

carnivores would of itself allow extremely slight lateral motion. Furthermore, not only the upper and lower canines pass by each other as the jaws are closed, but also the large premolars of the upper jaw lap over the corresponding lower molars externally, thus preventing any degree of lateral excursion. Hence, it would be impossible for facets to be formed physiologically on the lingual surface of lower teeth. In the Harbor Island material, the evidence of the modification of carnivore teeth by artificial grinding is conclusive in specimens of canine teeth of fox, bobcat, fisher, wolf (or dog) and of the extinct sea-mink, but not wholly convincing in a specimen of an otter's jaw.

Fox (*Vulpes fulva*). The left lower canine of a fox is shown in Plate XXVIII, *37*, a considerable portion of the tip being ground away. The enamel is also ground away near its margin on the inner curvature in the same plane as the ground surface at the tip. The striae seen in both ground surfaces extend transversely, so that it is quite evident that the tooth was ground crosswise along the edge of a whetstone, being held possibly either in situ in its socket or in the fingers.

Bobcat (*Lynx rufus*). The left mandible shown in Plate XXVIII, *38*, is evidently that of a relatively young animal, since the root of the canine tooth is still open. The tip of the tooth is ground to an angle of slightly more than 45 degrees, the striae being diagonal and being directed inward posteriorly as well as downward. The grinding here is quite certainly not due to impingement on another tooth.

Fisher (*Mustela pennanti*). A right mandible (Pl. XXVIII, *39*) shows about one-half the exposed portion of the canine tooth ground squarely off. The striae are for the most part directed transversely.

Wolf (*Canis nubilis*). While the canines of the wolf and the dog are quite similar, the large size of the tooth represented in Plate XXVIII, *40*, indicates that it is that of a wolf. While the root is perforated, the tip is ground off at an angle, the facet showing transverse striae.

Extinct sea-mink (*Mustela macrodon;* Prentiss, 1903). The canine tooth of the right mandible (Pl. XXVIII, *41*) shows its tip slightly ground and the edge chipped off. The two premolars present small facets on the lingual surface of their edges where the edge of the stone used to grind the canine rubbed across them. It would be quite impossible for the upper teeth to contact the surfaces where the facets are situated. The striae on the facets extend transversely. In another mandible of this species, in which the canine tooth is missing, the exposed portions of two premolars are largely ground away.

Otter (*Gutra canadensis*). The left mandible represented in Plate XXVIII, *42*, shows the tip of the canine ground off at an angle. The striae extend in various directions and the edge of the ground portion is

not sharp. Considering the changes that occur in otters' teeth during life, the modification of the tip in this specimen would not ordinarily be regarded as artificial. However, the enamel on the inner curvature and near its margin presents a facet in which there are coarse transverse striae quite suggestive of artificial grinding.

Thus it would appear that there is in the material here presented practically indisputable proof of the artificial grinding of the canine teeth of carnivores. That this was done for utilitarian purposes seems probable. Skinner[5] reports the use of the mandible of the lynx as a hook, "for untying the laces of snowshoes when frozen, and the fingers are too numb with cold to manipulate them. . . . It is not worked in any way."[6] It is to be noted that the eyes of the bone needles, holes made in teeth, as well as those in some of the harpoons from the locality from which this material came, are not smoothly drilled but scraped through or partially scraped and bored with some small implement. It is possible that small canine teeth with their hard enamel and sharpened to a cutting edge might serve for such purposes. While it seems to be the common practice to classify a tooth showing a perforation at one end as a pendant, it would appear worthwhile to consider the possibility of such objects being implements, especially if the tip has been ground to an edge.

In considering why rodent incisors were so widely used in preference to the teeth of other animals, the fact that they constitute useful implements in their natural state is probably significant. Perhaps also the facts that their shape was better adapted for use than other teeth, and that their great length made repeated resharpening possible, were significant. The dentine, of which the greater portion of the rodent incisor is composed, is no harder than that of various other unrelated mammals and the enamel of the rodent incisor is extremely thin and brittle. The lower incisors of the beaver, which are almost solid for a considerable portion of their length, the pulp cavity narrowing rapidly from the posterior end of the tooth, have the advantage of great strength. Since the pulp cavity in the upper incisor of the beaver is

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[5] Skinner, 1912, p. 44.

[6] In the Harbor Island collection is the left mandible of a wolf, the ramus of which has been removed by fracture after being sawed across. The fractured end has been smoothed somewhat by grinding and at this end a hole has been bored through the inner wall possibly for a suspension thong, while the outer surface of the body of the jaw has been scraped smooth. There are also two parallel grooves, the significance of which is not understood, extending longitudinally on the outer surface, one ending anteriorly in the smaller foramen. Except for a fractured premolar, the teeth are missing from the specimen.

large and extends the entire ength of the tooth, such teeth after being split serve for thinner implements.

SUMMARY

Beaver-tooth implements from sites in Brooklin, Maine, fall into as many as nine rather distinct types, as follows: (1) sharpened, unshaped lower incisors; (2) chisels shaped from lower incisors; (3) blunt-ended lower incisors: (4) implements with squared or concave ends; (5) gouges; (6) lower incisor knives shaped by scraping; (7) similar type knives from upper incisors split but not scraped; (8) split upper incisor knives with proximal or mid-portion ground to an edge; and (9) thin blades from lower incisors. There is some intergrading and a few combination implements occur. In all implements in which a notable amount of material is removed from the original rodent tooth, the shaping is accomplished, in case of lower incisors by a process of scraping, and of upper incisors by splitting off of about one-third of the dentine, in neither case by grinding. On the other hand, edges are sharpened and square ends are produced by grinding. Very thin blades, triangular in cross-section, derived from the lower incisor of the beaver, correspond as closely as the curvature of the tooth will allow, to the blade of the modern crooked knife. A stone adapted to the grinding of the lateral-edged rodent-tooth knives is figured.

The occurrence of aboriginal left-handedness is indicated by an example of reversal of the usual pattern of the beaver-tooth knife.

Evidence is presented of the artificial sharpening of canine teeth in the fox, bobcat, fisher, wolf, extinct mink, and probably otter.[7] The conclusion that the ground surfaces of the carnivore canine teeth in question are artificial is based on the apparent impossibility of such surfaces being produced physiologically.

Department of Comparative Pathology and
Tropical Medicine
Harvard Medical School
Boston, Massachusetts
February, 1942

[7] The late Glover M. Allen of the Museum of Comparative Zoology, Cambridge, Mass., kindly assisted in the determination of the species represented in the material studied.

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TWO NEW CAPE DORSET SITES

DOUGLAS LEECHMAN

TWO new sites of the Cape Dorset Eskimo culture were discovered, and partially excavated, by the author in 1935 and 1936. Both of them lie on the south side of Hudson Strait: one, examined in 1935, is on the south side of McLelan Strait, a narrow channel which divides Killinek Island from the northern tip of the Labrador, and contained both modern and Cape Dorset material; the other, which was examined in 1936, is on Nuvuk, an island or a group of islands, lying about thirty miles south-west of Cape Wolstenholme, at the west end of Hudson Strait, and contained only Cape Dorset material, with the exception of some quite obviously modern objects lying on the surface. Both of these sites lie alongside swiftly flowing channels which seldom, if ever, freeze over in winter. Here the seals come to breathe, affording the Eskimos a dependable food supply.

MCLELAN STRAIT SITE

This site lies at the west end of McLelan Strait, near Lat. 60° North and Long. 65° West, and is about five miles southeast of Port Burwell on Killinek Island, just north of the northern tip of the Labrador.

There are remains of at least eight houses and a wooden shack, which was still occupied in 1935. The houses vary greatly in age. The names of the occupants of some of the more recent ones are still remembered but others are so old that they are somewhat difficult to see, being mere shallow depressions in the surface soil.

Apparently the first scientist to visit the site was Dr. Robert Bell, of the Geological Survey of Canada, who was there in 1884. He says:

> The locality is called Nunaingok by the Eskimo, which means the "hidden place." . . . It is situated on an alluvial flat, extending between the two branches of the strait. . . . On top of a bank of sandy earth are the remains of an old Eskimo village. The roofs of most of the underground houses have fallen in, leaving only the circular pits. Some of these have become partially filled up, showing great antiquity. A few of the newest of them had been inhabited within a year. Some Eskimo encamped in the vicinity informed us, through our interpreter, that this had once been a comparatively populous village, and a resort of their people as far back as their traditions extend. It is their custom to live in the underground houses from the commencement of winter, some time in November till January, after which they leave them and spend the rest of the winter in igloes or snow houses. The water in the north branch of McLelan's Strait, they informed us, is open all winter at this point, and is much frequented by seals, which afford them a reliable supply of food. These animals they kill, either from their kayaks or by spearing them from hiding places which they have built of stones on every ledge and point of rock past which the seals are accustomed to swim. Great numbers of bones of seals, walruses,

reindeer, foxes, hares, birds, &c., lie scattered about on the surface and mixed with the earth around the old dwellings. The remains of stone pots and implements near others of European manufacture showed a transition from a barbarous to a civilized condition.[1]

Of the eight house ruins, I selected two for excavation: one, the most southerly, and apparently one of the oldest; the second, farther north, apparently more recent. The southerly house was rectangular and measured 18 by 15 feet, with an entrance about six feet long facing southeast, overlooking McLelan Strait. It was about thirty feet above high-water mark by aneroid.

Notes made at the time indicate that "a few specimens showing European influence were revealed while the grass was being stripped off." (This grass was only slightly more luxuriant than the surrounding vegetation.) "Specimens were not numerous in this igloo nor was the culture layer very deep. A lot of coarse angular sand had been blown in from exposed areas in the vicinity, and digging through this was slow and unproductive work. Except for surface material, no objects of European origin were found. Later a trench about two feet deep was run from the entrance right through to the back wall which consisted of steeply dipping bedrock. No lower culture layer was found by trenching and the igloo was abandoned, presumably completely excavated."

There were no traces of wooden roof timbers in this house; the walls were cut out of the gravel bank, and only here and there, especially at the front, were stones used to supplement the gravel. This igloo yielded the following proportions of materials: implements of stone (not including numerous flakes and chips), 54; bone, 8; ivory, 2; antler, 3; baleen, 3; and wood, 5.

The more northern igloo (again quoting from notes made in the field): "lies about 75 feet northwest of the south igloo and is a double structure, the two, almost equal, halves being separated by a stone wall about a foot wide and three feet high. The whole structure is 19 by 18 feet, with a long entrance facing northwest (towards a little cove). The westerly half seemed better constructed and a little deeper than the other and was therefore selected for excavation first. It proved to contain more specimens than the first igloo, but was more difficult to work in, as large sections of it were firmly cemented together with dried oil and grease, forming a kind of hard-pan. A good deal of frozen ground was met with, especially near the walls and at the south (shaded) end.

"A number of objects of European origin were found, such as pieces of iron, pottery and glass beads. These became less numerous as the

[1] Bell, 1882–4, p. 19 DD.

excavation deepened. A definite sleeping-platform, a lamp-place and a bench of stone for placing meat on were revealed. The floor was roughly paved with flat stones.

"A little work was done on the other half, in which part of the skull and a rib of a large whale were found (on the surface). The material found in the east half was of the same type as that in the west half, but less plentiful, and it may possibly have been used for keeping meat in rather than as a dwelling. It is possible that this igloo was roofed with whale bones and driftwood, bits of which latter were found in position.

"Several rubbish heaps were found along the beach of a little cove lying a few yards north of the group of igloos."

The fact that many Cape Dorset specimens were found in the lower layers of this igloo and modern specimens were found nearer the top, together with the remains of roof timbers, leads me to assume that an old Cape Dorset house, possibly contemporaneous with the southerly igloo, excavated in the gravel, had been re-occupied, roofed, and strengthened in front with a wall of stones, in more recent times. Its appearance, and that of the comparatively lush grass round about it, suggests that it may have been one of the houses Bell spoke of as having been "inhabited within a year" (1884). The specimens collected in this house were of the following materials: stone (not including numerous chips and flakes), 96; bone, 26; ivory, 5; antler, 26; baleen,3; and wood, 33.

The rubbish heaps yielded only two ivory specimens, and 203 stone objects, again not counting numerous chips and flakes. It is interesting to note the large proportion of quartzite in the stone specimens, no less than 70 per cent of them being of this material. Of all the specimens collected, 77 per cent were of stone. The source of the quartzite is not known to the modern Eskimos, who use fragments from the old village site when they have need of it.

THE NUVUK SITE

Nuvuk is an island, or a group of islands, lying about thirty miles southwest of the Hudson's Bay Company's post at Eric Cove, near Cape Wolstenholme, at the west end of Hudson Strait. The distance by boat is about thirty-eight miles.

There are two groups of house ruins, the more northerly and smaller one containing five house sites, one of which is rectangular and the other four circular; and a more southerly and larger group containing fourteen, all of them circular. One of them, the most recent in appearance, is double.

In both groups, the houses appear to have been excavated in a bank of coarse gravelly sand, and only two of them showed any sign of walls. One of these was the double igloo which had such a recent appearance and on which the grass was lush and green. This ruin, as well as the others, yielded only Cape Dorset material. In one other igloo there were signs of walling on one side, in the form of a crescent. Walls can hardly have been present in any of the other ruins, for they were very shallow depressions and even a low wall would have been conspicuous. There was no sign of roofing in any of the ruins. The entrances were completely obscured, except in the case of the double igloo; here the entrance faced about east, towards the beach.

In the larger group, the heights of the igloos above sea level varied from 37 to 60 feet, averaging 46 feet. The smaller group, distant some 700 feet from the other, varied in height above sea level from 20 to 28 feet, the average being 23 feet. These heights were determined with an aneroid, measuring from high water-mark on the beach.

Most of the house sites were difficult to see. They were very shallow circular depressions and there was no variation in the colour or growth of the grass to indicate their presence. It is very possible that some of them were overlooked. In the larger group most of them were stretched along a low gravel ridge, probably an old beach.

With the exception of a few surface specimens, quite obviously modern, the material excavated all belonged to the Cape Dorset culture. Specimens made of wood, bone, ivory and antler were comparatively rare, only stone objects having resisted decay successfully. In the two groups of house ruins, ignoring surface specimens, there were about the following proportions of specimens and materials: stone, 185; ivory, 31; bone, 29; antler, 23; and wood, 3. Stone specimens formed 66 per cent of the material collected here, of which 47 per cent were of chert, and only 10 per cent were of quartzite, compared with 70 per cent of quartzite at McLelan Strait. Some of the chert was banded, and was reminiscent of similar chert used on Southampton Island.

The interior arrangement of the houses could hardly be made out, though the common plan of a sleeping-platform at the back and a lamp stand near the door and at one side seemed to be suggested. The large double igloo might have shown the arrangement more clearly had time permitted its complete excavation, but I had only nine days and much bad weather. The houses varied from 15 to 20 feet in diameter, but the edges of the depressions were so indefinite that measurement was often difficult and probably inexact.

The site is still used by the Eskimo. A group of about twenty people moved on to it on the same day that I left, August, 20, 1936.

DESCRIPTION OF SPECIMENS

In the following paragraphs no attempt is made to describe every specimen, or indeed every type of specimen, collected; only objects which are typical of the sites or of special significance are mentioned. In view of the fact that the material from the two sites is so much alike, it is not felt to be necessary to separate the descriptions into two sections.

Harpoon heads. Only nine specimens were found, a surprisingly small number. Eight were from Nuvuk and one only from McLelan Strait; this last was a small wooden one, presumably a toy or a grave model. It is of the modern type, with a closed socket, and is not contemporaneous with the Cape Dorset material.

Of the eight from Nuvuk, six had the rectangular type of socket associated with the Cape Dorset culture. Only three are approximately complete, and each of these has two line-holes side by side (Pl. XXIX, A, *1,2:* IX-B-271, IX-B-263);[2] one has an end-slot for a blade (Pl. XXIX, A, *3:* IX-B-269), the other two had no separate blades.

Of the three broken harpoon heads with rectangular sockets, two appear to have had double line-holes, and one a single line-hole, but nothing can be deduced as to the presence or absence of slots for blades.

The two other harpoon heads from Nuvuk Island are a toy (Pl. XXIX, A, *5:* IX-B-272) with only a vestigial socket and two line-holes, and a harpoon head with an open socket, one line-hole (at the side) and no end blade (Pl. XXIX, A, *4:* IX-B-262), of a type very common in the original Cape Dorset collection.

Small, lozenge-shaped pieces of ivory or antler have been found in several of the larger collections of Cape Dorset material, and their origin and purpose was something of a mystery. I found two at Nuvuk (Pl. XXIX, A, *6:* IX-B-228), but none at McLelan Strait. In conversation with Graham Rowley, he suggested that they were sections cut away in the making of harpoon heads. The typical Cape Dorset harpoon head has a very definitely V-shaped base, and these lozenge-shaped bits fit neatly into the V. This hypothesis is still further strengthened by the fact that Rowley found unfinished Cape Dorset harpoon heads at Igloolik with this piece still in position, and grooved in preparation for separating it from the finished harpoon head.

Harpoon foreshafts. No foreshafts were found, and their scarcity remains one of the obscure features of this culture. Foreshafts intended for use with the harpoon heads having the rectangular sockets must have had a tip shaped like a screwdriver. As for the much simpler type

[2] Numbers refer to catalogue numbers of the National Museum of Canada.

of harpoon head with an open socket (Pl. XXIX, A, *4*), which may well have been used for fishing, no foreshaft would be necessary, as is seen when we consider that similar harpoons and harpoon heads, without foreshafts, were used by a number of Indian tribes in fishing. Furthermore, no harpoon-foreshaft-sockets are known from the Cape Dorset culture.

Barbed points. Five of these were found at Nuvuk, but none at McLelan Strait. Four are of ivory, and one of bone. Two have a slot for fastening a line, or a lashing; in the case of the bone point, the slot is near the side, where the material is thin and easily worked. In the other case, it is in the middle (Pl. XXIX, A, *7:* IX-B-198). The other three are broken and may, or may not, have had line-holes. In some respects, these points resemble the bladder-dart of modern Eskimo culture.

Knife handle. Only one specimen, made of either bone or antler, was found. This was on Nuvuk Island. It is incomplete, the posterior part having been cut off, and only the anterior section with the blade socket in the side remains. In shape it resembles many other handles from Cape Dorset sites and may have held one of the thin rubbed blades of chert or nephrite which appear to be peculiar to the Cape Dorset culture.

Chipped stone points. A total of 181 chipped points and blades resulted from work on the two sites. Fifty of these were from Nuvuk, and the remaining 131 from McLelan Strait. Of these latter, 128 were of quartzite, two of chert and one of basalt. At Nuvuk there were only seven quartzite implements; sixteen were of chert, six of basalt, eighteen of quartz, two of shale, and one of an unidentified igneous (?) rock.

The McLelan Strait points, as a whole, give the impression of being more skilfully made than those from Nuvuk Island, though none of them shows the very fine serrated edges that are observed in some Cape Dorset points.

There is a surprising variety of form to be found in this group; no less than eighteen types are clearly distinguishable, and more refined subdivisions might easily be made. A brief summary only need be presented:

1. Notched points: (a) Straight base, flaring convex anterior edge, 1 from McLelan (Pl. XXIX, R, *8:* IX-A-571*a*); (b) Concave base, straight sides, chipped on one side only, 7 from McLelan (Pl. XXIX, A, *9:* IX A-609 *a*); (c) Small chert points, chipped on one side only, 4 from Nuvuk (Pl. XXIX, A, *10:* IX-B-346); (d) Straight base, deeply notched, chipped on one side only, 1 from McLelan (Pl. XXIX, A, *11:* IX-A-610); (e) Straight base, long, slender, chipped on both sides, 9 from McLelan, 1 from Nuvuk (Pl. XXIX, A, *12:* IX-A-374); (f) Straight base, short and broad, chipped on both sides, 1 from McLelan, 9 from Nuvuk (Pl.

XXIX, A, *13:* IX-B-133); (g) Tanged, chipped on one side only, 3 from McLelan (Pl. XXIX, A, *14:* IX-A-531*b*); (h) Tanged, chipped on both sides, 2 from Nuvuk (Pl. XXIX, A, *15:* IX-B-338); (i) Blades with double notches at base (all incomplete, 5 from McLelan (Pl. XXIX, A, *16:* IX-A-559*g*); (j) Notched, carinated, 1 from McLelan (Pl. XXIX, A, *17:* IX-B-483*a*); and (k) Curved blade (not Cape Dorset "curved knife"), 1 from Nuvuk (Pl. XXIX, A, *18:* IX-B-171).

2. Points without notches: (a) Large, knife-like blades, some with tangs, 5 from McLelan (Pl. XXIX, A, *19:* IX-A-402*a*); (b) Straight base, slender, chipped on both sides, 11 from McLelan (Pl. XXIX, A, *20:* IX-A-405*e*); (c) Straight base, carinated, 14 from McLelan (7 fragmentary), (Pl. XXIX, A, *21:* IX-A-409*a*); (d) Concave base, triangular, long, concave sides, 2 from McLelan (Pl. XXIX, A, *22:* IX-A-538*b*); (e) Concave base, triangular, short, straight or convex sides, 5 from McLelan, 5 from Nuvuk, (Pl. XXIX, A, *23, 24:* IX-A-609*e*, IX-B-219); (f) Convex base, retouched principally on one side, 10 from McLelan (Pl. XXIX, A, *25:* IX-A-615*c*); and (g) Slender, flake-like blade, thick, strongly retouched, 1 from McLelan (Pl. XXIX, A, *26:* IX-A-334).

Deserving of special notice are the fourteen points with one face showing a definite keel (Pl. XXIX, A, *21*) which seem to be associated specially with the Cape Dorset culture. Wintemberg found these in Newfoundland[3] and their distribution is now carried to the northern tip of the Labrador. None was found at Nuvuk Island.

Chipped ovoid blades. Small ovoid blades, retouched all round and on both faces, are frequently found in sites of the Cape Dorset culture (Pl. XXIX, B, *1:* IX-A-481*d*). They are carefully made and may have been used as side blades for knives. Three quartzite specimens were found at McLelan Strait and one, of milky quartz, at Nuvuk.

An examination of the sockets in a series of knife handles from the original Cape Dorset site showed that four of them retained dirt and debris which had been present when the specimens were collected. This material was extracted and examined with a microscope. In each case, flakes of baleen were found in the socket, and it is suggested that thin sheets of this substance may have been used as a packing to hold the blade more securely in place. There appears to be no other good reason why this material, so seldom used in the Cape Dorset culture (though common in the Thule), should be present in each case investigated.

Scrapers. Fifty-six scrapers were found, forty-five of them at McLelan Strait and eleven at Nuvuk. Of these last, two were of quartz and nine of chert. All the McLelan Strait scrapers were of quartzite.

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[3] Wintemberg, 1940, p. 95.

The Nuvuk Island specimens are a good deal smaller than those from McLelan Strait, the average length of the former being thirteen-sixteenths and of the latter one and five-sixteenths inches. Three types are clearly distinguishable in the McLelan Strait specimens; they are illustrated in Plate XXIX, B, *2, 3, 4* (IX-A-593*e*, 561*d*, 561*f*). The type shown in Plate XXIX, B, *3*, is the most numerous and shows the greatest variation in form. The specimens from Nuvuk Island are all small and squat. One of them is only half an inch square.

Notched scrapers. Three notched scrapers were found, two of them at McLelan Strait. All are of quartzite. Another quartzite specimen, also from McLelan, suggests a combination of a multi-notched scraper and a reaming tool (XXIX, B, *5:* IX-A-543); there are no less than four notches, each of a different size, and with the inner edges considerably smoothed by use.

Side scrapers. Five scrapers (?) of a somewhat unusual type, two of them incomplete, were found at McLelan Strait. One is shown in Plate XXIX, B, *6* (IX-A-661). All of them were of quartzite. Examination with a hand lens shows a good deal of smoothing of the edges and points, presumably by use. One of the broken specimens is left-handed. The distribution of this type of implement is curious. Wintemberg lists: Newfoundland, Inuksuk sites in Greenland, the east coast of Hudson Bay, and St. Lawrence Island, Alaska.[4]

In addition, there are specimens in the collections of the National Museum of Canada from three other sites: Port Burwell, Hopewell Sound, and Southampton Island, the provenience of the last one being marked as doubtful.

Wintemberg refers to these tools as "concave side scrapers" and suggests that one of his specimens[5] "may have been used for making the rectangular sockets for harpoon points, for which purpose it seems to be admirably adapted." This is quite true for his specimen, but those collected at McLelan Strait are too large for such a purpose.

Curved knives. Eight of these implements, so characteristic of the Cape Dorset culture, were found, five of them at Nuvuk Island and three at McLelan Strait. These last were all of quartzite; those from Nuvuk of chert. In every case, the original plane of fracture is seen on one face. The angle of off-set is remarkably constant at about 45 degrees. One specimen, from Nuvuk, is left-handed.

Narrow flaked blades. These laminate blades occur frequently in Dorset sites (Pl. XXIX, B, *8:* IX-A-557*a*); the cores from which they were struck, however, seem to be scarce. Considerable variation in size

[4] *Ibid.*, p. 100. [5] *Ibid.*, Pl. V, Fig. 6, No. 34.

is noted, specimens in crystal quartz, especially, tending to be small; one such specimen, from McLelan Strait, is just over half an inch long. In spite of its small size, one end is carefully retouched into a rounded form. Of the total of 129 of these blades collected, forty-seven or about 36 per cent were retouched: ten on the side; eight at the end; and twenty-nine at both side and end.

It was found by experiment that one of these flakes, of quartzite, which had not been retouched, made a fairly efficient saw. It was tried on a piece of antler and a smooth, slot-like groove was readily produced after the antler had been softened a little by dipping it in water. The sharp edge of the flake wore away quickly at first, but soon assumed a form which was more stable. It then looked, at first glance, as if it had been retouched, but on closer examination it was clear that the chips removed were much smaller, and the fractures less conchoidal in shape, than in the deliberately retouched specimens. Moreover, the chipping resulting from the use of the flake as a saw was not confined to one face, as is the case when a flake has been retouched intentionally. It is probable that these tools were used to do much of the slotting which, in the Cape Dorset culture, takes the place of drilling.

Chipped-and-ground implements. Implements of chert, nephrite, and similar close-grained materials, which were first chipped and then rubbed or ground into shape, are common in Dorset sites. Those of nephrite are often ground on all faces and edges, resulting in a "machined" appearance, while those of chert are usually only partially rubbed after chipping.

Artifacts of this type were noted by both Wintemberg and Rowley[6] and several were included in the original collection on which the Cape Dorset culture was based by Jenness in 1925.[7] A number of them were found also at Nuvuk Island and at McLelan Strait (Pl. XXIX, B, *9:* IX-B-166).

Gravers. An implement which appears to be a graver (Pl. XXIX, B, *10:* IX-B-134) bears a sharp point which would seem to be adapted to the slotting technique used by the Cape Dorset people. Much of this slotting can be done with the narrow flaked blades, as already described, but some of the more delicate work, such as perforating the eyes of needles, would seem to call for a sharp point such as this implement bears. Using a flaked blade to make the initial slot, I was able to perforate a slip of walrus ivory one-sixteenth of an inch thick in a little over twenty minutes on the first attempt. The flaked blade proved quite suitable for making the slots, but I found this tool much better for the

[6] *Ibid.*, Pl. 16, Fig. 1, Nos. 7–10; Rowley, 1940, Fig. 2*g*.

[7] Jenness, 1925, pp. 428–437.

later stages. The work went faster if the tip of the tool was kept moist with saliva, and a pushing stroke cut more effectively than a pull. There was a great risk of breaking the working point, especially if it were not held quite upright. Any inclination to the side allowed it to bind on the sides of the groove, whereupon it would snap off, as was discovered by experiment with other gravers.

Whetstones. Sixteen whetstones were found in all, two of them at Nuvuk Island, and fourteen at McLelan Strait. They are of several different kinds of stone, all comparatively soft and fine grained. The comparative scarcity of rubbed blades and points from Nuvuk Island tallies well with the small proportion of whetstones found at that site. One whetstone was once an adz blade, or a skin softener, as is shown by part of a ground edge which is still visible.

Rubbing stones. These are, in reality, but another kind of whetstone; their somewhat specialized form and the use to which they were probably put, as well as their frequency in the Dorset culture, have led to their being placed in a separate group. Two were found at McLelan Strait, but none at Nuvuk. Both of the McLelan Strait specimens are of a fine-grained quartzite which has been rubbed to a smooth, slightly concave surface. Specimens from other Cape Dorset sites are sometimes smoothed on more than one side. There is a definite tendency to use the edge of a rubbing stone, rather than a flat side, if the stone itself is a thin, flat one. This is brought out quite clearly in the rubbing stones collected by Rowley at Igloolik.

It is thought that these rubbing stones may have been used for polishing nephrite artifacts. The hardness of quartz (and quartzite) on Moh's scale is 7; that of nephrite is from 6 to 6½. Actual experiment shows that these rubbing stones cut or polish nephrite fairly quickly; but so also do many of the ordinary whetstones, though these produce a rougher finish. Possibly the fine-grained rubbing stones were used for polishing only, for the nephrite specimens have a high polish, unobtainable with the coarse whetstone.

Soapstone vessels. Twenty pieces of worked soapstone were found, ten at each site; few of them are large enough to indicate the size or shape of the original vessel.

On comparing these fragments with other specimens, however, several of them can be assigned to one or other of three definite types. Wintemberg reports[8] from sites in Newfoundland "parts of rectangular pots, with the sides more or less vertical and the narrow ends sloping outwards from the base," much like some modern Eskimo wooden ves-

[8] 1940, p. 317.

sels. Two corners of similar pots were found by the author at the McLelan Strait site. They agree very closely with Wintemberg's specimens, even having approximately the same angle of slope at the narrow end —55°—whereas his were "about 60°." Jenness found scars of this type of pot on the face of a soapstone quarry in Newfoundland.

One of the McLelan Strait specimens shows blackening from use; the other apparently broke while being made, for it shows no signs of use, and the inside has not been brought to the same stage of perfection as has the outside.

A second type of vessel does not appear to have been recorded before. It was, apparently, a shallow, oval, flat-bottomed dish, measuring about four inches by five. The sides were low, a little less than half an inch high and sloped outwards at an angle of 25 degrees from the vertical. The bottom is of the same thickness throughout, just over three-sixteenths of an inch. A section of a vessel of this type, showing five inches of the rim, was found at McLelan Strait (Pl. XXIX, B, *11:* IX-A-581). Somewhat similar pieces occur in the original Cape Dorset collection, but Rowley does not seem to have encountered this type of vessel at Igloolik, nor Wintemberg in Newfoundland.

The third type of soapstone vessel identified with the Dorset culture appears to be the most common. It is an oval bowl of thin soapstone, the length being about one and a half times the width. Rowley found a number of these thin, graceful vessels at Igloolik[9] and both Lloyd[10] and Wintemberg[11] mention them.

A very curious feature of these vessels is that some of them were painted red. I mentioned this point when describing the two Cape Dorset sites now under discussion at a meeting of the American Association for the Advancement of Science in Ottawa (June 27, 1938), but hesitated to say positively that the red coating was an intentional paint. I had noticed the same thing in some of the soapstone in the original Cape Dorset collection, however. Now that Rowley has since found the same feature common in his Igloolik site, and both Nuvuk Island and McLelan Strait had previously yielded other examples, it becomes clear that this is a Cape Dorset characteristic. Red is the only color found so far; sometimes it is used inside and sometimes outside the pot; in other cases both surfaces were colored. The paint, or the medium it was used with, does not appear to be very permanent. In some cases broken fragments, when fitted together, show that the paint may have disappeared almost completely from one piece while the adjoining part may still be brightly colored.

[9] See Rowley, 1940, Fig. 1*a*. [10] 1876, p. 237. [11] 1940, p. 317.

Adz-like blades. Three stone blades, with one edge ground, were found. One of these has already been mentioned in discussing whetstones; it is from Nuvuk Island. The other two, one of which is only a fragment, are from McLelan Strait. In all of these specimens, the ground edge is only moderately sharp, and their use as skin softeners rather than as cutting tools is suggested.

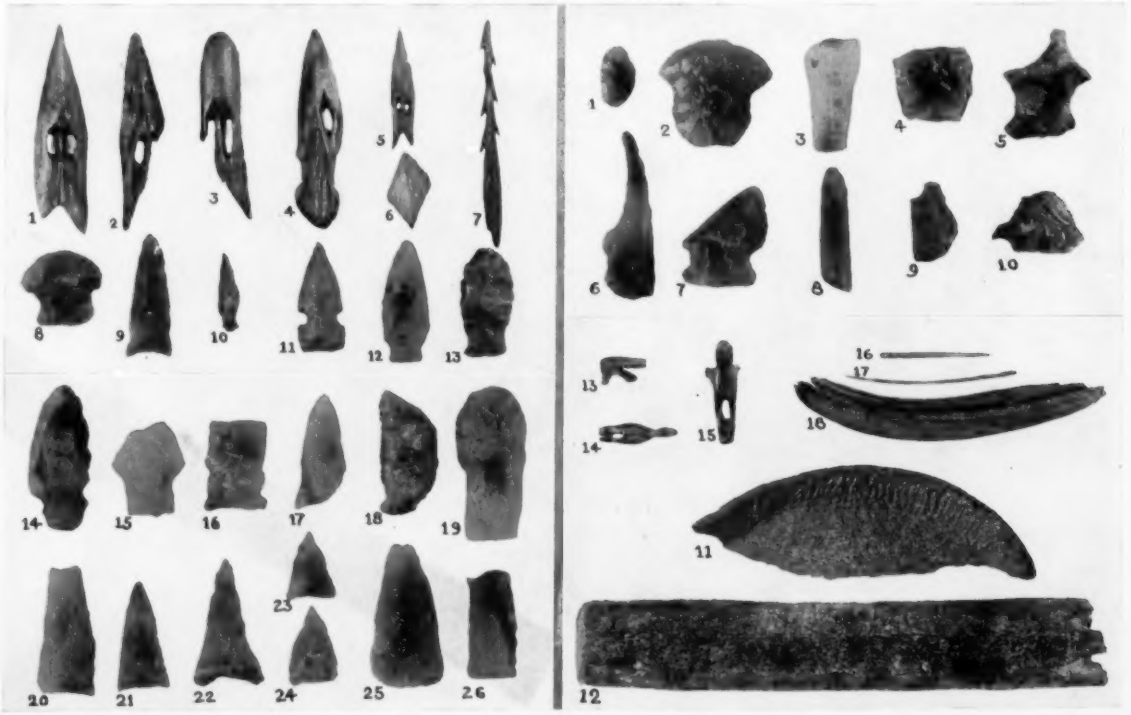
Sled runners. Two specimens were collected on Nuvuk Island which appear to be runners for small sleds (Pl. XXIX, B, *12:* IX-B-231). A number of these objects were in the original Cape Dorset collection, but their use was not suspected when they were first examined. They proved to be similar to others found by Rowley at Igloolik, and he suggests that they are sled runners. Slots for the lashings are gouged out, not drilled, and are so placed that the lashings would be below the surface, and thus protected from abrasion. Roughly parallel striations, due to their use as runners apparently, are evident on the outer surface. The Cape Dorset culture shows no evidence of the use of dogs in transportation, so it can only be assumed that small sleds were dragged by hand.

Rowley says that "Analysis showed dark blood stains on the running surfaces of these ivory shoes"[12] but subsequent chemical tests have failed to confirm this statement.

Carved figurines. Delicate carvings in ivory, bone, and antler seem to be a marked feature of the Cape Dorset culture. Three were found on Nuvuk Island (Pl. XXIX, B, *13-15:* IX-B-277, 264, 276): a bear, in bone; a bird, in ivory; and a bone toggle carved in the shape of a man at one end and a seal at the other.

Needles. Nine specimens were found, all at Nuvuk. Most of them are less than one-sixteenth of an inch thick and less than an eighth of an inch wide; they vary in length from just over an inch up to about three inches (Pl. XXIX, B, *16, 17:* IX-B-283, 279). The eye is present in four of them; in each case it is at one end of the needle, and is slotted or gouged out, not drilled. In addition to the needles, three pieces of bone were found, grooved in such a way as to suggest that needles were to be made from them. One of these, a piece of rib (Pl. XXIX, B, *18:* IX-B-286) shows two deep parallel grooves. The "land" between them is a fraction over one-sixteenth of an inch wide and, as the grooves follow the natural curve of the rib, is strongly curved. This curve is obviously a deliberately sought feature, and suggests that the curving observed in other Cape Dorset needles may be intentional, rather than due to warping. Boas, in speaking of the process of covering the kayak with

[12] Rowley, 1940, p. 493.



Artifacts from two Dorset sites. A: *1–7, 10, 13, 15, 18, 24,* Nuvuk Island; *8–9, 11–12, 14, 16–17, 19–23, 25–26,* McLelan Strait. B: *9–10, 12–18,* Nuvuk Island; *1–8, 11,* McLelan Strait.

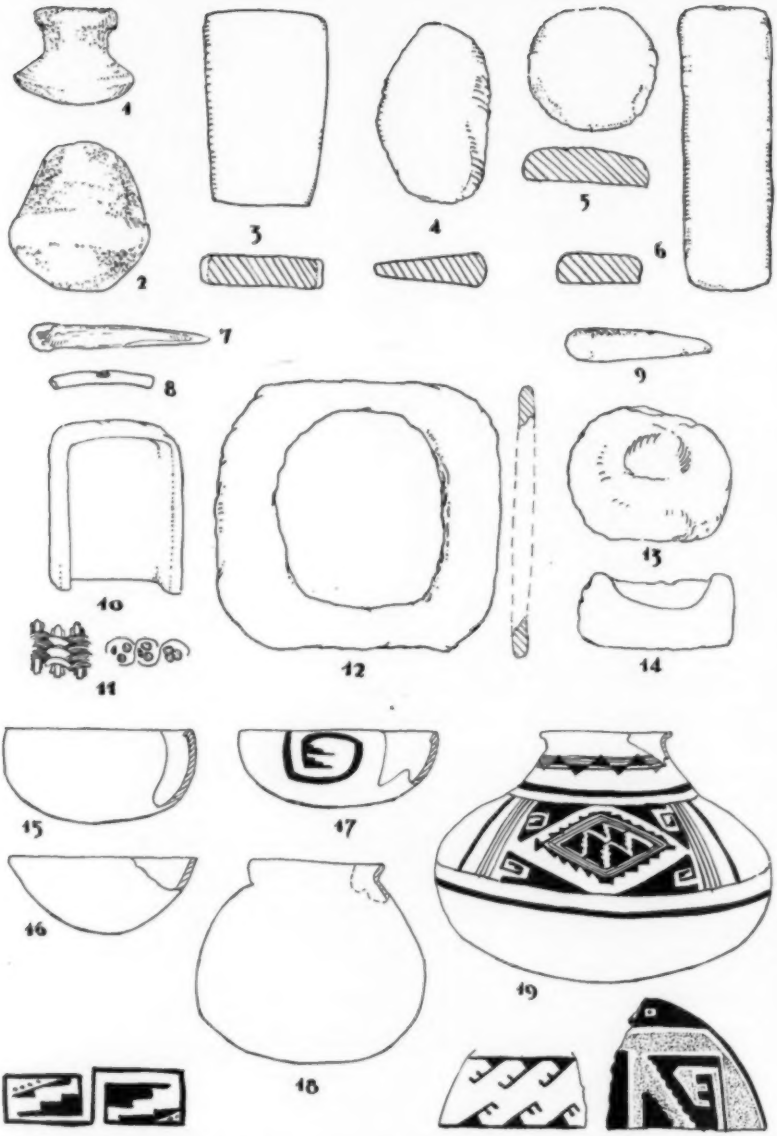


FIG. 38.—Artifacts from Kinnikinnick, Arizona (see page 367).

skins, says: "The skins are sewed together with sunken stitches, the thread which is made of sinew, being evidently applied with a *curved* needle."[13] (The italics are mine.) Possibly the Cape Dorset people used curved needles for some similar purpose, but we have no evidence, direct or otherwise, that they were acquainted with the kayak. Many Cape Dorset needles, however, are quite straight.

CONCLUSION

Cape Dorset specimens have now been collected from about forty different sites in the Eastern Arctic, and number several thousands. The outstanding feature of the culture still remains the absence of certain culture elements which we usually consider as typical of the Eskimo, especially the bow-drill, the kayak, and dog traction.

No effort has been made, in this paper, to show the distribution of various culture elements in the Cape Dorset, though it is becoming evident that some features found in the Newfoundland aspect are not to be found further north. Detailed discussion of these distributional features must await another paper.

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National Museum of Canada
Ottawa, Canada
January, 1942

[13] Boas, 1903, p. 11.

EXCAVATIONS AT KINNIKINNICK, ARIZONA

SYDNEY CONNOR

THE tree-ring record in the Flagstaff area goes back to about 500 A.D., with one gap in the sequence prior to 1317 A.D. To close this gap of forty years, a sampling was taken from Kinnikinnick ruin on Anderson Mesa twenty-two miles southeast of Flagstaff. Material found there in June, 1940, by Dr. A. E. Douglass, yielded dates from the earlier part of this missing period. The location of the site on the postulated southern boundary of the Sinagua branch of the Mogollon[1] made it of further significance. It seems to have escaped notice by early investigators, is pot-hunted very little, and has not been reported on up to this time.

The site, situated in Township 17 north, Range 11 east, section 5, Coconino County, and designated by the Museum of Northern Arizona survey as NA 1629, is a conspicuous mound of ruined masonry, overgrown with brush and small cedars, on the brink of Kinnikinnick Canyon, a dry course which eventually joins Padre Canyon. The site rests upon an old lava flow, exposed in picturesque cliffs at the edge of the canyon. This overlies Moencopi sandstone which is completely hidden, save for two spots of bright red soil where it weathers out in talus slopes below. The uplands back of the site are typical mesa country of the upper Sonoran life zone, with pinyon and juniper forest. On the canyon slopes and in its rocky bottom grow deciduous trees, sedge grass, flowering plants, and an occasional yellow pine. A large black walnut grows at the foot of the slope below the site, in what appears to have been, in favorable seasons, a seep. The creek itself, furnished by Kinnikinnick spring, a mile and a quarter above the ruin, does not flow except in rainy seasons, but maintains good water, probably steadily, standing in pools among the boulders a half-mile up the ravine from the site.

Early in July, 1940, Milton Wetherill of the museum staff, Ted Stern, and the writer excavated a large quadrangular room on the east side of the pueblo, overlooking the canyon, and adjoining, on a higher level, the room from which Douglass got his material. The character of the masonry, correlating with that used in the upper walls of Douglass' room, suggested later building; its location facilitated removal of the heavy fall of stone which completely filled the room.

After this accumulation of rock from fallen walls was removed down to traces of burned roof material, the blackened character of portions of the walls and the material below suggested that the roof had collapsed due to fire, and the objects found below it could be treated as representing what was in the room at the time of the fire. The quantity of sherds found mixed with ashes and broken artifacts suggested that the area

[1] Colton, 1939, pp. 33–35, 42–44.

had been a dump for a short time following its abandonment, although not long enough for this refuse material to show important change in ceramics or artifact style. No other stratigraphy was evident, except for an undifferentiated compaction of the material toward the floor.

The room is a large (4.90×3.60 meters) quadrangular arrangement without discernible entrance or beam supports in the walls. Two small depressions in the clay floor, a meter and a half from each end, lie along the north-south axis of the room. The rock-and-fill walls, fifty centimeters thick, are of coursed, unworked basalt, partially faced with Moencopi sandstone, and retain traces of plaster. The eastern portions have eroded following the contours of the mound.

Three hundred sixty-one pounds of potsherds were brought back to the laboratory for study, of which 1 per cent were decorated, black-on-yellow and polychrome, mostly importations from the Hopi country. The utility ware, made much in the manner of the regions to the north, is tempered with crushed basalt[2] similar to that available in the streambed below the site, is evenly smoothed or wiped so as to achieve three or four varieties of surface texture, and has been named Kinnikinnick Brown and Chavez Brown. The latter name derives from a large site[3] to the east where these wares are also evident. Shapes of the utility ware are shown in Figure 38, *15*, *16*, and *18;* designs and shapes of the decorated wares, Bidahochi Polychrome, Jeddito Black-on-yellow, in the same Figure, *15*, *17*, and *19*, and accompanying designs. The utility ware also includes dippers, miniature dippers, a worked sherd disk, two jar stoppers, various baked tablets and crudely made animal figurines.

Other artifacts recovered include objects of stone, bone, shell, and plant fiber. The forms of most of the stone objects are shown in Figure 38. The eighty manos are represented (Fig. 38, *3-6;* of which *3* occurs most frequently). Thirteen metates, of sandstone and vesicular basalt, mostly resemble Figure 38, *10;* the others are flat, quadrangular and without other special characteristics. Sixteen round stones had been smoothed on one or both sides and used for hammering. Other objects are represented in Figure 38 by the following numbers: bone awls, *7;* perforated bone tube, *8;* pottery anvils, *1* and *2;* pestle-like object of vesicular basalt, *9;* basalt bowls, *13;* half of a basalt mortar, *14;* crude sandstone ring, 63 cm x 68 cm, *12*. Other objects include full groove and three-quarter groove axes, shaft polishers, three-quarter groove hammer, triangular obsidian projectile point, dressed flakes, worked hematite and malachite, banded silica, quartz crystal, glycimeris bracelet, haliotis and glycimeris pendants, and various whole shells (drilled *conus*, *turitella* and *olivella*).

The fiber materials include yucca cord, charred fragments of square-

[2] Cotton, 1941, pp. 44–45. [3] Fewkes, 1896, p. 532.

knotted net, a sandal toe made of paired yucca leaves woven under-one-over-one, a fragment of Oraibi-type wicker basket or plaque (Fig. 38, *11*), and a piece of textile described as follows by Kate Kent: "split or tapestry weave cloth, cotton weft on warp of probably two-ply yucca. Stitch count: five and a half to six warps per centimeter, thirteen wefts per centimeter. Technique: wefts not drawn through width of piece, but twined back and forth over three warps three times and then moved over a warp to right or left and the process repeated. Slits generally separate wefts of different colors."[4]

Associated flora and fauna include charred corn, corncobs, kidney beans, walnut shells, service berry and cotton seed. Antelope, deer, jackrabbit, cottontail, wood rat and prairie-dog bones, skeleton of red-tailed hawk, and the tibia of a bobcat, made into an awl, were found.

Of sixty-three datable pieces of charcoal,[5] 8 per cent show dates 1093 to 1257 A.D.; 29 per cent, 1269–1287; 63 per cent, 1290–1311. The sparsity of material in the earlier category suggests re-use of old timbers. The regularity of interval and evenness of distribution of material after this time suggests use and repair of this room from the middle of the thirteenth century up to the time of the fire and abandonment of the room.

Most of the awls, ornaments, paint stones and decorated pottery were found on or near the floor. Lumps of fired clay, sandstone slabs, pottery anvils, stone dishes, and a mortar were either on the roof or in refuse material.

Two slabs of red sandstone, one larger than the other (Fig. 38, *12*), have not thus far been identified with any of the cultural branches of northern Arizona.[6] Haury reports[7] a similar object from Showlow ruin in the White Mountains, found in almost identical circumstances. The hole in the slab was "large enough to admit a man" and it is suggested that such devices served as door frames. A man could wriggle through the one figured here, if adapted to a sixteen-inch doorway.

A second variety, not found as yet at Kinnikinnick, has been reported from Pinedale in the White Mountains,[8] and several south of Joseph City[9] in which the circular opening is smaller and neatly trimmed. The Pinedale example was smoothed on one side, painted black and yellow and compared to usages similar to altar boards used by the Zuni. Hough[10] found them east of the Petrified Forest. Since these were set with other slabs into a three-sided box, and located apart from the house, he thought them to be stoves.

The third variety, represented at Kinnikinnick by a broken half, showing a small, neatly drilled hole, is reported from kivas in the White

[4] Cf. Steen, 1935, p. 458; also Hough, 1914, p. 81.
[5] Dated by John C. McGregor. [6] Colton, 1939.
[7] Haury and Hargrave, 1931, p. 19. [8] *Ibid.*, p. 56 and Fig. 14.
[9] Postelthwaite, W. W., Personal Communication, 1941. [10] Hough, 1901, p. 320.

Mountains,[11] near Winslow,[12] Petrified Forest region,[13] and Awatobi.[14] Fewkes[15] gave them wide distribution: from the areas mentioned and from New Mexico. "Many extracted from the floors of kivas; others generally with an orifice of larger size, from the soil covering the rooms." He finds them also in burials.

The authorities quoted show a number of kiva floors paved with flat slabs, where a series of holes of this size have been drilled in a straight line as though to accommodate a loom, and agree in associating it with this, or other kiva usage. If such prevailed at Kinnikinnick, subsequent excavation should reveal a kiva, as an added trait for this Sinagua time period. If the larger slab is not a doorway, but a crude altar board, its presence here should strengthen this view. Neither stone compares in location of finding with the boxlike structures reported by Hough and Postlethwaite which seems to have been characteristic of the area defined as the Winslow branch of the Anasazi.

From the sampling of material from this site, no conclusive inferences can be drawn. If further excavation proves Kinnikinnick to have been a Mogollon site, as many of its articles indicate, the presence of flat metates, arrow shaft polishers, full groove ax, and decorated pottery from the Hopi area will still testify to considerable incursion of northern ideas.

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[11] Haury and Hargrave, 1931, pp. 87 and 96.
[12] Fewkes, 1896, p. 523.
[13] Hough, 1901, p. 312.
[14] Brew, J. O., Personal communication, 1942.
[15] 1904, pp. 106, 160–161.

PREHISTORIC CANALS IN THE SALT RIVER VALLEY, ARIZONA

ALBERT H. SCHROEDER

ONE of the greatest concentrations of the Hohokam in the desert of southern Arizona was in the region of Phoenix where the westerly flowing Salt River was tapped to supply the arable lands with water.

Many theories have been woven about these prehistoric canals which lined the valley and were plainly visible to the first settlers in 1866. As is only natural, the early pioneers noted, followed, and reused many of the Hohokam canals. Through such close association, the farmer and hydraulic engineer became curious as to the story behind them. Physical features were noted and maps were drawn by interested persons. Theories were developed. It was thought that the canals were 2000 or more years old, that they were all functioning at the same time, that the water supply was greater in prehistoric times because the present heads are from six to sixteen feet above the river bed, and that the presence of alkali flats in the valley was proof of waterlogging and the reason for the eventual abandonment of the valley. However, their interpretations were handicapped. The science of irrigation was in its beginning stages and there was little in the way of archaeological data on which to base these theories. It was not until the Hohokam culture had been given its proper berth by Gila Pueblo some five years ago and the results of scientific studies of irrigation became known that information, other than visual, was available.

The canals in the Salt River valley were first noted by trappers, surveyors, and army parties. Gen. J. R. Rusling remarked about them in 1867[1] as did William H. Pierce.[2] Early settlers made use of sections of the prehistoric canals for their irrigation.[3] Patrick was the first to record these features on paper, gathering data on them from 1878 to 1903 at which time he published the results of his survey.[4] Turney worked from 1887 through 1929,[5] publishing a map of the canals as well.[6]

A rough average of the prehistoric data assembled by these sources, excluding some extremes, records 135 to 150 miles of canals, the longest of which ranged from twelve to fourteen miles, serving from 100,000 to 240,000 acres and supporting a population of 80,000 to 200,000.[7] In 1920,[8] the aggregate of modern main canals was about 240 miles, serving some 300,000 acres, supporting a population of 90,000.

[1] Turney, 1929, p. 3. [2] *Ibid.*, p. 4.

[3] *Ibid.*, pp. 51–52. See also Hodge, 1893, p. 327; and McClintock, 1921, p. 214.

[4] Patrick, 1903. [5] Turney, 1929, p. 53. [6] *Ibid.*, facing page 12.

[7] Compiled from sources mentioned in the bibliography.

[8] Figures supplied by T. A. Hayden, Chief Ass't Engineer of the Water Users Association, Phoenix.

Such a comparison is all well and good, but a number of points must be considered. It is obvious that the natives did not cultivate as much land per person as do modern farmers, when implements and methods are considered. It would have been impossible for them to have cultivated as much land at any one time as the modern farmer, since they did not have reservoirs upstream. The Salt River today, excluding its reservoirs, giving a 100 per cent supply of water, would only be sufficient to irrigate 20,000 acres or less, and there is no evidence to postulate any appreciable change in the river's flow since prehistoric times. Also to be considered, is the number of canals in use at any given time. The mileage of canals has little to do with the area irrigated. The size, grade, capacity, and water available control the area. Population estimates are extremely shaky. At present, more than 50 per cent of the valley's inhabitants gain a living in non-agricultural fields; without means of estimating the number of non-agriculturalists among the prehistoric people, any statement is seriously handicapped.

The modern and prehistoric canals correlate well with the topography of the country. Many of the Hohokam canals represented on the maps mentioned above are now non-existent due to agricultural leveling and the spread of real estate improvements since the time of recording. Of those noted, only about seven miles out of the total are to be considered failures. How the natives managed to construct them without the aid of instruments is not known in detail. They may have introduced water into the ditches during construction to watch the direction of flow at intervals along the way, much in the same manner as we use a level in determining grades. Today, one still finds hammerstones and broken stone hoes on their banks. The latter, perhaps plus stone shovels and wooden shovels,[9] suggest the tools used. The excavated material may have been carried away by means of baskets, blankets, or rough litters.[10]

Mr. T. A. Hayden, Assistant Engineer for the Salt River Valley Water Users Association, makes the following statement in a letter to the author dated December 19, 1939:

> I do not find it difficult to visualize the building of these canals with handle-less stone hoes and baskets and no engineering skill. The problem of determining the ditch grade could readily be solved by starting at the river and admitting water as construction proceeded. By digging a comparatively small ditch at first, the water would not only show the proper grade but also soften the earth so that the excavation would be easy with hoes of stone or even with sticks or bare hands. By beginning with a small ditch the work could be strung out for a long distance and men . . . employed along the entire length. Give me 500 men and I will dig 15 miles of 6-ft. ditch with such tools in a year or give me 100 men and I will build 3 miles in a year. The probabilities are that the first

[9] Fewkes, 1912, p. 146.

[10] Pima legends tell how the dirt was loosened by means of digging sticks and thrown out by hand. They also record failures concerning the correct grade.

ditch was only a foot or two wide and that its depth and width were increased as needed. It is most unlikely that a 50-ft. ditch 6 ft. deep would be undertaken as an original project. Such a ditch would contain 70,000 cu. yd. per day, would require 140,000 man days or roughly a year for 500 men. On such a basis the building of 10 or 15 miles—much less 150 miles of canal—is too incredible to be seriously considered. But figured on the basis of a progressive development, the undertaking does not seem particularly difficult . . . .

Few canals have been trenched in the past. Hodge records one at Los Muertos 30 feet across at the top and 4 feet wide at the base, in all being 7 feet deep. He adds that three feet below the bank there was a bench three feet wide on either side.[11] This may represent an accumulation of silt similar to that built up by present day ditches. However, only through future investigation of the soil in question will one be able to determine whether these benches were silted up or were a definite construction feature. At a fork in this same canal, post holes were uncovered along the outer banks. Hodge postulates that they represent the foundations of a headgate.[12]

There is considerable variation in size. Patrick mentions a large canal 75 feet across at the top, 40 feet at the base, and 6 feet deep.[13] Cushing notes another 20 feet across.[14] Matthews records some running from 10 to 30 feet across at the top and 3 to 12 feet in depth.[15] One canal, at a distance of eighteen (?) miles from the river, was 15 feet wide at the base, 25 feet at the top, and 10 feet deep, the banks extending five feet above the general surface.[16] Another, near Culver and Fourteenth Streets, Phoenix, five miles from its head, was 93 feet wide.[17] The water of a canal south of the river and directly south of Phoenix was kept on grade across a low area by banks six feet above the desert.[18]

Many of these canals have been traced to the river, and "In all instances, where the canals can be traced to the river's bank it is found today [1903] that the present bed of the river is from eight to fifteen feet below the bed of the ancient canals. . . . "[19] To remove all doubt of his finding the canals at the river edge, Patrick remarks that " . . . in several instances at or near the river, the excavation (of the canal) has been in gravel and the borders of the canals are still standing to heights varying from six to twelve feet. . . . "[20]

There is no evidence of the river having changed its course since the turn of the fifteenth century, as is pointed out by Matthews.[21] However, the channel is known to have moved from one side of the bed to the other. During the floods of 1916 and 1920 the channel was on the north side. At present it is on the south.[22]

[11] Hodge, 1893, p. 325. [12] *Ibid.* [13] Patrick, 1903, pp. 6–8.
[14] Turney, 1929, p. 11, quotes Cushing. [15] Matthews, 1893, p. 147.
[16] Turney, 1929, p. 45. [17] *Ibid.*, p. 47. [18] *Ibid.*, p. 51.
[19] Patrick, 1903, p. 4. [20] *Ibid.* [21] Matthews, 1893, p. 143.
[22] Conversation with Mr. T. A. Hayden.

The fact that the canal beds lie eight to sixteen feet above that of the river suggests that erosion has lowered the river. However, on intermittent streams or during natural or artificial dry cycles, stream beds of alluvium are eroded during floods and then built up as the floods subside, with a stage following the flood when small channels are again eroded in the alluvium. Vertical cutting is negligible after the stream approaches grade; the head of water loosens the soft banks and lateral cutting occurs. This suggests that the heads now encountered may not be the true heads. The canals may have extended farther upstream, but the portion extending to the true head may have been removed by lateral cutting, removing all traces of the original heads. For example, Turney records two canals, one northeast of Mesa with a head twenty-six feet above the present river bed, another north of Mesa, with head sixteen feet above the river.[23] Since the river falls ten feet in a mile here, the difference in elevation between these canals, which are about one and a half miles apart, can be explained if their true heads were farther upstream. Turney mentions a series of canals (System Two) through the region of Phoenix that is sixteen feet above the river bed.[24] The modern Grand Canal, in the same area, is higher than System Two and has its head to the east, at Tempe; the modern Appropriator's Canal, also higher, takes water about a mile east of Tempe, both heads undoubtedly being further east than the true heads of System Two. Erosion of a mile and a half from the heads of these canals would present a situation similar to that of the prehistoric canals; they would be higher in regions common to both because their true heads would have been farther upstream.

In 1870 and 1877, the Mormons at Mesa cleaned out and re-used a number of the prehistoric canals, constructing stone and brush diversion dams, that were washed out by winter and spring floods, to lead water into the canals.[25] No mention is made of deepening the beds—only repair. This situation is evidence that the water in the river was high enough in the 1870's to enter the old canals with brush headgates. In short, the water level was at, or nearly at, the same level as in prehistoric times. Hence, if the river contained water equal to that of prehistoric times in the 1870's and if surveys in the late nineteenth century record canal beds eight to sixteen feet above the river bed, there is only one answer: the distance between the present prehistoric canal heads and their true heads has been erased by lateral cutting.

There is a curious circumstance that might be mentioned in passing. The present canals below Joint Head receive water from the live channel, lying below the general level of the bed, which is dry over the main part of its width. This water is from return seepage, sub-surface flow

[23] Turney, 1929, p. 50. [24] *Ibid*, pp. 4 and 48. [25] McClintock, 1921, pp. 213–214.

passing the diversion dams which do not extend to bed rock, and from canal waste. There is no evidence to show that the prehistoric canals along this western portion of the river did receive their water from a lower depth than did those upstream, that is, from beneath the surface of the bed. These, like the others, took water from the river itself, pointing to a good supply of water throughout the extent of their use. The fact that this western part of the river could have flowing water in it, due in part to return seepage, as in 1889,[26] adds to this belief. If the water table was high in prehistoric times, these western canals could have drawn water from a flowing stream even though canals higher up had practically taken all the flow at their headings. However, brush and rock dams could not completely dry the channel. Even with the pumping system employed to lower the water table today, water rises a short distance west of Phoenix; when the pumps are idle in winter, the flow is considerable.

In regions where irrigation is practiced, the problem of waterlogging is common knowledge. For example:

> Fifteen years ago the place (Fresno Colony) was a desert, and water could not be reached at a less depth than forty, and from that to eighty feet . . . . Water can now (1886) be struck anywhere on the plain at a depth of ten feet, and in many places at six feet. (Area cultivated—60,000 acres) . . . . One of the largest vineyards has not been watered in two years, and the owner has actually been compelled to dig ditches to a depth of six feet to drain his land![27]

Another source remarks in 1889:

> In the Salt River Valley since irrigation began, (1867) the water has risen nearer to the surface by forty feet . . . . The Salt River, below where the main canals are taken, from the middle of May to the middle of July, when the river is usually at its lowest stage, has rather increased than diminished its flow of water.[28]

Waterlogging occurred at Tempe as cited by Turney:[29]

> . . . Jas. Goodwin and his brothers cleared the brush and leeched out these salts by flooding and changed this alkalied ground into choice farms. Owing to an impervious stratum to the west of these lands, they became waterlogged after thirty years of use, and a drainage ditch was constructed.

Waterlogging began in the area south of the United States Indian School in Phoenix about fifty years after modern irrigation began, being relieved only by pumping.[30] In 1920, irrigation, in the area now comprising the Salt River Irrigation Project, had raised the ground water so much that the land had been injured.[31]

A contour map of 1903[32] shows the water table ranging from ten to fifteen feet below the surface at the river's edge to 125 feet in the vicinity of the Phoenix Mountains. As one goes away from the river or up-

[26] Farish, 1889, pp. 15–16. [27] Hamilton, 1886, p. 12.
[28] Farish, 1889, pp. 15–16. [29] Turney, 1929, p. 4.
[30] *Ibid.*, p. 44. [31] Census of the U. S., 1924, p. 60. [32] Lee, 1905.

stream, the water table drops. The sub-surface water contour lines roughly parallel the river with one exception, that being in the vicinity of Tempe. This is caused by an underground barrier,[33] probably the same one referred to by Turney. Another manifestation of this is pointed out by Lee. In 1903 there was permanent water in the river up to the Tempe Canal, backed up and raised by the impervious layer below.[34]

Because of the lack of a pumping system, the prehistoric people undoubtedly encountered difficulties with waterlogging. Return seepage would have been greater than that of today for comparable loads entering the fields. They may have had drainage ditches, but there is no evidence of them. The fact that alkali flats were encountered throughout the valley by the pioneers in the nineteenth century may testify that the natives were troubled with waterlogging. However, such areas are formed under natural conditions by an overabundance of salt carried into the soil by water, and dropped by evaporation.[35] When sufficient salts are concentrated in any given area, only the hardiest of vegetation can survive. Agriculture would be impossible. Local, waterlogged fields may have occurred. This possibility must be kept in mind. If it took place, the natives would have been forced to move from one area to another.

In summarizing the evidence, certain facts stand out. The capacity of the Salt River is apparently the same as in prehistoric times, and its waters could be made to enter the canals at Mesa. The problem of the varying heights of the canal beds above the river bed will probably never be worked out in detail. It is known that floods in the late nineteenth century removed the modern canal headings, and it is more than probable that similar occurrences took place in the past. How far the ancient canals extended upstream may be estimated by continuing the grade until the stream bed is reached. Lateral erosion explains the varying heights of the present canal heads.

Though little archaeological excavation has been conducted on canals, two have been investigated recently in an attempt to determine the time element. One, at Snaketown, excavated by Gila Pueblo, was assigned to the Gila Butte and Santa Cruz phases,[36] and the other, at

[33] *Ibid.*, p. 125. Formed by Tempe Butte-South Mountain chain.

[34] *Ibid.*, pp. 121–122.

[35] Of 100,000 parts of water, 132 are solid. Of these 77.6% is salt. Crenshaw, 1911, p. 46.

[36]

Gila Butte Phase:	500– 700 A.D.	
Santa Cruz Phase:	700– 900 A.D.	
Sacaton Phase:	900–1100 A.D.	
Santan Phase:	1100–1150 A.D.	
Soho Phase:	1150–1300 A.D.	Classic Period
Civano Phase:	1300–1400 A.D.	Classic Period

Pueblo Grande, excavated by Hayden, to the Sacaton phase. The proximity of the Classic Period compounds to these canals suggests that the inhabitants made use of them. Thus, there is some archaeological data to support the idea of non-contemporaneity.

These canals represent a tremendous undertaking, on the face of it, if they were constructed within a short space of time; but, like a trash mound, they may represent either a relatively short project undertaken by many people or a long task accomplished gradually by a few. If the canals were not contemporaneous, as the above indicates, the size of the undertaking is lessened.

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ARCHAEOLOGICAL NEEDS FOR FLORIDA

FREDERICK W. SLEIGHT

CONSISTENT and concentrated efforts for archaeological research within the region of Florida have long been a needed factor in the development of North America's pre-history.

Here lies one of the key spots for cultural contact between the northern continent and the chain of islands that extends southward. The geographical significance of such a location can not be too highly emphasized. What work has been undertaken in the state unfortunately has not been followed by careful laboratory consideration and, as a result, prehistory in this area has suffered from mere spontaneous spurts of effort. Clarence B. Moore[1] gave to the field of archaeology one of the most complete examples of research in Florida that has been noted to date. Over a period of several years, Moore traversed the coast of Florida and explored numerous important river areas in search of burial mounds and other aboriginal sites. At almost every site, using the excavation techniques of his day, he brough forth thousands of examples of pottery as well as many fine specimens of copper, shell, wood, and stone. The unfortunate point to be made concerning these finds is the rather scarce data that are to be found relative to the individual finds themselves. Generally speaking, little thought was placed on the recording of stratigraphic relationships—one of the greatest tools of archaeology. But Moore, by means of his extensive project, preserved for future workers many important artifacts that might well have passed into the hands of "pot-hunters" by this date. A study of these collections, now deposited in various museums at the disposal of students, might well lead to the definition of numerous important cultural aspects.

The spectacular discoveries of F. H. Cushing during the latter years of the past century in the Key Marco region[2] brought to the world of science many new ideas and theories as to the position of the Florida aborigines in the great drama of pre-Columbian America. In the muck-filled basin of the northern fringe of Key Marco, Cushing located numerous examples of a woodcarver's art that has found little competition among neighboring cultures. Of still greater importance at the site is the appearance of "South American, Antillian, and even Mexicanoid" traits all of which may indicate strong trade and possibly physical contacts with the peoples to the south. The whole culture at Key Marco pointed to a strong sea-faring type of people, dependent on the sea for their food as well as a means of transportation. But here again, as in the case of Moore, this research was not followed up.

[1] Moore, 1894–1918. [2] Cushing, 1896.

A bibliography of Florida archaeology, such as is being compiled at the present through the facilities of the Florida Historical Society and the Committee on Florida Archaeology, indicates the interest of other workers in the subject of Florida prehistory: A. E. Douglass, Albert S. Gatschet, and Jeffries Wymann all contributed to this problem. In more recent times Bushnell, Fewkes, Hrdlička, Nelson, Stirling, and Swanton have seen the need for efforts in Florida. Through the aid of Federal funds and through the work of related institutions, much has been added to our knowledge of this region. E. F. Greenman of the University of Michigan, through the aid of the Moore reports, has brought forth some interesting data concerning the relation of Florida traits to those of the Hopewellian. He has shown that "the number of traits for the Hopewellian based upon descriptions of facts, constructional features of mounds, and burial types, for the major groups of Ohio, Wisconsin, Illinois, and Michigan, is 321."[3] In a study of seventeen mounds in Florida, Mr. Greenman found that 133 of these traits are represented. Thus, one can easily see that work in Florida may lead to significant cultural ties with some of the more important groups, not only to the south, but to the north as well.

A plan for the future has been set by the Committee on Archaeology for Florida organized in 1939. This committee has set forth five purposes which point out the basic needs for Florida. Primary, of course, is a thorough plan of site surveys with intensified excavations on what appear to be typical sites. The state should be divided into workable divisions in which careful study of pottery types, both in horizontal and vertical scales, may be made. With such a plan of correlation of traits, definite cultural horizons, as well as areas that would add much to our knowledge of the Southeast, may appear.

Secondly, it has been proposed that definite steps be taken to arouse interest in this neglected area. This not only applies to the student of prehistory but also to the layman. Among the latter, an effort should be made to stimulate a certain degree of responsibility in the preservation of archaeological remains such as mounds and camp sites. Unfortunately, vandalism and "pot hunting" has gone rampant in Florida and, with no governing force in past years to restrain such destructive actions, many valuable sites have been sacked. Allied with this point of arousing interest in the field is the dissemination of information by means of lectures and the printed page.

As is the case in many states, the basis of such studies should be found in the establishment of a Department of Anthropology in one of

[3] Greenman, 1938, pp. 327–332.

the colleges or universities of the state. Here the work would not only have institutional backing, but also an opportunity would be given students to study the various phases of anthropology. In direct association with such a department, the results of field exploration and earlier collections should be made available to the public as well as to the student through the facilities of a modern museum. At the present time, much of the material excavated in Florida by Moore, Cushing and others has of necessity had to be taken to outside institutions.

Under the auspices of the Committee on Archaeology, three definite projects have been completed and a fourth associated task is in a formative stage. Firstly, a detailed map has been compiled showing the archaeological features of Fort George Island, located at the mouth of the St. John's River. Rogers Johnson, formerly a staff member of Carnegie Institution of Washington, was responsible for the execution of this project. A second assignment was carried out by the author in the summer of 1940 which resulted in a site survey of the Ten Thousand Island region south of Key Marco. In this locality, one burial mound and eight village sites similar to the type excavated in part by Cushing were found. In all cases, surface collections of sherds, shell utensils, and implements were made where such artifacts were encountered. A third project was completed last winter (1941) by the Excavator's Club of Harvard, under the joint sponsorship of the Committee and the Baker Museum at Rollins College. This group conducted a test dig on a shell mound site which is located on a flood plain about five miles northwest of Geneva, Florida.

Several definite results have developed from this work. It has shown that Florida does have an unknown archaeological background comparable to neighboring areas to the north and south. Stratigraphic tests, such as were noted by Nelson in shell mound exploration, have pointed to an avenue of approach in which cultural development may be ascertained. An interesting problem is afforded by Mexicanoid traits in this region. Artifacts uncovered by Cushing at Key Marco point, in many cases, to such similarities, and many of the finds of Moore show definite Central American trends. Construction of platform type mounds with ramp style approaches suggest influence from the more advanced cultures of Middle and Central America. Examination of shell carving and the ornamentation of pottery yields many similarities to related arts in Mexico. Through all the Gulf states and numerous areas to the north, gorgets of shell engraved with grotesque Mexican-like figures have come to light and illustrate an advanced style and technique. In fact, these objects might be classed with the outstanding artistic products of North American aborigines.

But the problem still remains—do such traits of Mexicanoid character indicate actual contact with this area by the peoples of Middle America; do they represent merely trading expeditions into these outposts of the Gulf area; or do the traits disclose a diffusion of ideas that were seized upon by these less advanced peoples of the Southeast. Vaillant[4] points out that from present knowledge it appears that contact between the two major areas of Mexico and the Southeast could not have been by actual trade and physical contact but merely by means of "the passage of ideas and attitudes." However, this is a problem with many sides and one that holds a major place in the needs for further archaeological research in Florida.

Fewkes and several others have considered the problem of contact with the Antilles. In the Weeden Island explorations, Fewkes found pottery indicative of West Indian types.[5] That physical contacts were possible between the islands and the mainland of Florida is certain, for numerous instances of the passage of native craft among the islands and to the mainland are cited in historical records of the sixteenth century. Writers of the period of conquest often comment on these feats of daring. In the author's opinion, research in the Keys of Florida and the adjacent sectors of the mainland would add much to clarify contacts that may have existed in pre-Columbian days.

A comparative study of early Spanish, French, and English manuscripts, reports, letters, etc., might also cast information upon the cultural aspects of the tribes encountered in Florida during the early years of conquest. A critical examination would be necessary but considerable information could be accumulated from these writings. Comparisons might then be made with artifacts found in association with historic trade objects and thus aid in developing both horizontal and vertical distributions for that period. With these factors known and with the aid of such techniques as stratigraphy, typology, etc., work could be carried back to the earliest levels of occupation.

Another important need that should be realized by members of the archaeological world, not only in Florida but in other states as well, is a problem that has received due comment before in this publication. Three types of excavators are involved: the "pot hunter," the ardent amateur who has good intentions but often too little background or foundation for his work, and the individual who poses as an expert but who is only a deterrent to the progress of serious research. The "pot hunter" should be corrected by some form of legislation, whereas the interested but inexperienced amateur should be encouraged to study

[4] Vaillant, 1939. [5] Fewkes, 1924.

methods of recording information he gains and advised not to delve into projects too great for his ability. This man could be, and often is, of utmost aid to the study of archaeology. The worst kind of impostor is the man who has had little or no training in the principles of anthropology and its research techniques and who presents himself to the public as an expert in the field. He not only spreads incorrect and erroneous information but also develops in the public distruct of all archaeologists and archaeological ventures. As in other areas, there are such individuals in Florida, and if ever the archaeology of Florida had a "need," it is the need of doing away with such "scientists."

In the above presentation, the author has tried to present the definite importance of the peninsular state in solving the archaeological picture of America as a whole. To understand fully the past developments of this country, no stone should be left unturned.

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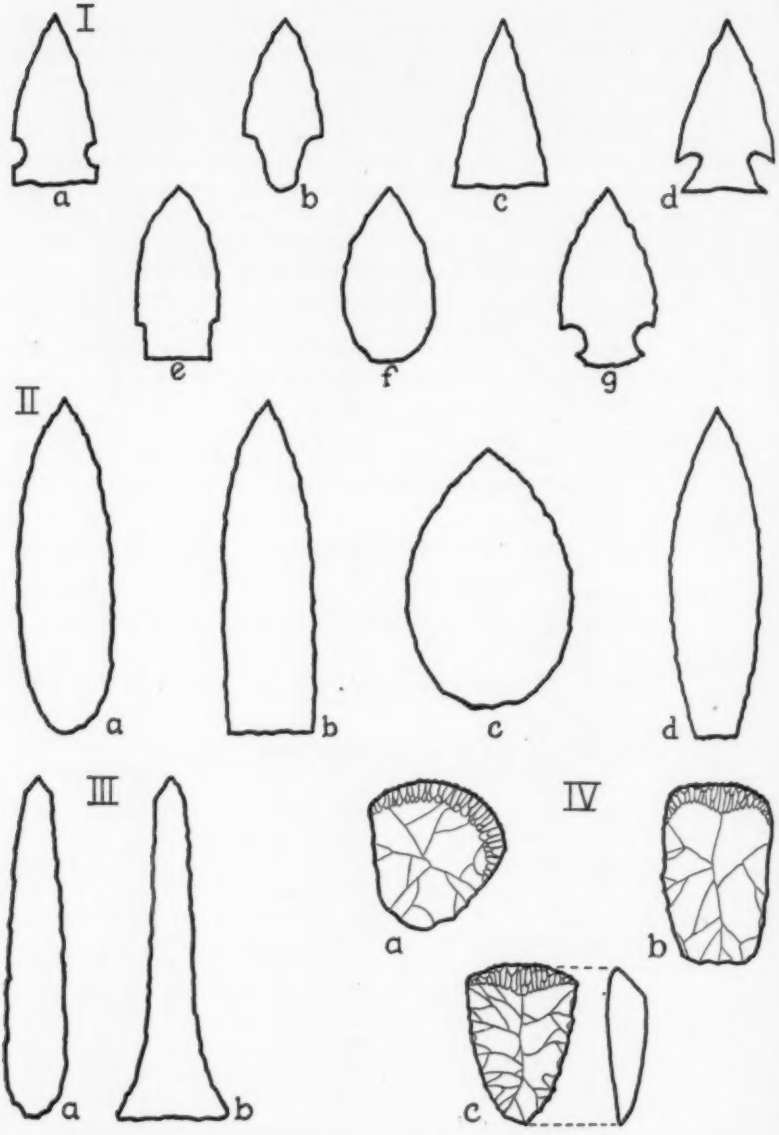

FIG. 39.—Types of chipped implements associated with the Woodland pattern.

THE FIRST ARCHAEOLOGICAL CONFERENCE ON THE WOODLAND PATTERN

The term "Woodland," as employed in the American archaeological field, has come to be used by local students to serve a variety of dissimilar cultural purposes, and to lack clear definition to general students and instructors. To the regional specialist "Woodland" may be interpreted in terms of his own local manifestations; to the ceramic analyst, in terms of a variety of pottery; and to the ethno-historian, in terms of tribes or migratory bands. There is little wonder that the uninitiated general student, in utter bewilderment, has demanded a definition for "Woodland," or has refused to recognize it as a useful, valid term.

The areal specialist, within whose field of intensive research has been encountered and studied the evidence of cultural manifestations which closely resemble those originally called "Woodland," has known that the term held true significance. He has experienced little difficulty in differentiating local varieties from extraneous cultural matter, and he has been convinced that he could readily identify the general character of the culture pattern although he could not define it in detail. He has long recognized the need of a conference where he and his fellow regional specialists might compare data and discover those traits which might run as threads through the entire cultural fabric, and so serve as determinants for the pattern. The demand for such a conference became general and insistant. Finally, the idea crystallized into a definite program, and the first Woodland Conference convened in the anthropological laboratories of the University of Chicago, on May 12–13, 1941.

It was recognized that the Conference was an initial experiment, that the problems were many and complex, that the time available to the delegates was unreasonably limited in consideration of the magnitude of the program, and that any successful results of the meeting were probable in direct ratio to a simplification of the procedure. Consequently, simplification was sought through the delimiting of the area to be represented. The maximum in problems might be expected to characterize culturally marginal areas where the influences of locally strong "foreign" cultures and the geographical remoteness of dominating cultural relatives would tend to encourage the greatest variation from traditional ways of living. Consequently, it was decided that this first experiment in Woodland conferences should confine its attention to a restricted field roughly comprising a middle belt where Woodland-like manifestations had long been recognized as of major importance and where, for the most part, the greatest percentage of attention had been devoted to Woodland research. This geographical belt was rather arbitrarily defined to include: New England, New York, Ohio, Indiana, Illinois, Michigan, Iowa, Wisconsin, Minnesota, and Nebraska. It seemed reasonable to suppose that if representative students in an area extending from Maine to Nebraska could agree on anything definitive of Woodland, a basis could be established for a further extension of the field of inquiry, at some later date, to include Woodland-like manifestations wherever present outside this belt of initial consideration; whereas, the failure of the limited inquiry would indicate, and probably define, either the fallacy of the Woodland concept or the inadequacy of the methods employed.

There was no thought of dogmatically excluding any area, or of intolerance toward the personnel in outlying fields. Those who organized the Conference may be accused of inadequacy in method, but not of egotistical provincialism. The active delegates recognized the importance of an eventual check, particularly by representative students in Canada, the Atlantic maritime states, and the Southeastern area. However, they concurred in the opinion that any defendable classification of cultural manifestations under a Woodland pattern head could be tentatively established by a collaboration of research

workers within the middle area considered at the Conference. It remains their opinion that the results of the Conference justify this prediction.

Personnel and Organization

Delegates to the Conference included: for New England, Douglas S. Byers, Director, and Frederick Johnson, Curator, Peabody Foundation for American Archaeology, Phillips Academy, Andover; for New York, Arthur C. Parker, Director, and William A. Ritchie, Curator of Archaeology, Rochester Museum of Arts and Science, Rochester; for Ohio, Richard G. Morgan, Curator of Archaeology, Ohio State Museum, Columbus; for Indiana, Glenn A. Black, Director of Archaeology, Indiana Historical Society, Indianapolis; for Illinois, Fay-Cooper Cole, Chairman, Department of Anthropology, University of Chicago, Chicago, and Thorne Deuel, Director, Illinois State Museum, Springfield; for Michigan, Carl E. Guthe, Director, University Museums, and Emerson Greenman, Assistant Curator of Archaeology, Museum of Anthropology, University of Michigan, Ann Arbor; for Iowa, Charles R. Keyes, Director of Archaeology, Iowa State Historical Society, Iowa City; for Wisconsin, W. C. McKern, Curator of Anthropology, Public Museum, Milwaukee; for Minnesota, Lloyd A. Wilford, Assistant in Anthropology, Department of Anthropology, University of Minnesota, Minneapolis; for Nebraska, A. T. Hill, Director of Archaeology, and Marvin Kivett, Archaeologist, Nebraska Historical Society, Lincoln; consultant in pottery, James B. Griffin, Assistant Curator of Archaeology, Museum of Anthropology, University of Michigan, Ann Arbor.

Guests to the conference included: Georg Neumann, Research Associate in Anthropology, University of Michigan, and Moreau Maxwell and John Bennett, University of Chicago.

W. C. McKern was elected to serve as Chairman of the Conference, and Richard A. Morgan to serve as Secretary. Douglas S. Byers (Chairman), Fay-Cooper Cole, and W. C. McKern were selected as a Committee for Documenting and Distributing the Results of the Conference.

The Conference was made possible, and its activities greatly facilitated by the sincerely appreciated cooperation of the University of Chicago which authorized the Department of Anthropology to sponsor the meeting and provided such essential accommodations as conveniently grouped meeting, laboratory, dormitory and restaurant facilities.

Procedure

The methods of procedure adopted and followed by the Conference were founded on the unqualified acceptance of the delegate or delegates from each of the recognized regional districts as the final authority for that district. This ruling served greatly to expedite the business in hand by automatically eliminating long, inter-regional arguments founded on one side purely on hearsay. A delegate who had worked in another delegates' area was permitted fully to present his data and opinions. Each delegate had been instructed previous to the meeting to organize his data and to bring to the Conference any desired quantity of notes and materials. The order and nature of the subdivision of cultural subject matter to be considered was determined by majority vote, as the work proceeded, and it was agreed to treat material culture, where most convenient, in terms of artifacts arranged under cultural sub-heads. Any delegate could ask for the consideration of a trait under the cultural sub-head in question, and the trait was presented for balloting, the delegation for each represented region voting as to the presence or absence of that trait in Woodland manifestations within its area.

The votes were qualified as to whether the trait is: *common*, present with various

Woodland manifestations (not necessarily all) and considered to be characteristic for Woodland in the area; *present*, characteristically found with one or more Woodland manifestations but not considered to be generally characteristic for Woodland in the area; *rare*, known instances of Woodland association; *very rare*, a known instance of Woodland association; *absent* (0), not present with Woodland manifestations; *?*, doubtfully present, data indicative but not conclusive; (space not filled), present in the area but data as to Woodland association lacking; *X*, characteristic for Woodland manifestations, in instances where the quantitative factor is not directly involved.

The results of the voting was recorded on a master ballot, of which a copy was later sent to each delegate for deliberate study and checking under the more ideal conditions prevailing in the office or laboratory of the delegate. As a result of providing each delegate with this opportunity to directly consult his source records, certain corrective changes were made in practically every ballot. A revised master ballot was then prepared in consideration of these corrected data.

The committee intrusted with documenting the Conference report tabulated the distribution of traits according to the revised master ballot. Traits found associated with Woodland manifestations in all areas were selected as the first acceptable traits for the Woodland pattern complex. In addition, it seemed advisable to add those traits occurring in all but one area, since the presence of a trait in Woodland manifestations in nine out of ten subdivisions of an area extending from Maine to Nebraska demonstrates an extremely broad cultural significance. No trait was accepted for the pattern which is not found in eastern, central, and western parts of the area studied. Furthermore, the paucity of data on Woodland manifestations in Ohio, where nearly all investigations have related to the Mississippi pattern or the highly specialized Hopewellian manifestations, raised the question as to whether purely negative data from that state could be accepted as a positive vote of absence. It was finally decided not to consider the absence of information from Ohio as a negative vote. When the tabulation was completed, the tentative trait complex for the pattern was found to include eighty-one traits, of which many involved a great deal more minute detail than had been expected. For example, there are twenty-five pottery traits in the list.

A condensed, but not altered, statement of the data contained in this list of traits, arranged under cultural-subject headings and modified in consideration of quantitative and distributional factors supplied by the ballot, is presented herewith. It differs from the original list only in matters of arrangement: several related traits may be restated as a single trait. The Conference releases this as the first tentative trait list offered in justification of the classificatory term: Woodland Pattern.

The Woodland Pattern Complex

1. Semi-sedentary community life most widely representative.
   (a) Unspecialized fireplaces and refuse pits at village sites.
2. Subsistence characterized by the primary importance of hunting, fishing, and the gathering of wild vegetal foods. (See "Agriculture" under: Significant variations.)
3. Mortuary customs most widely representative:
   (a) Disposal in cemetery plots or in scattered burials. (See "Mounds" under: Significant variations.)
   (b) Primary and secondary single types most common; with primary and secondary multiple types, and some form of cremation occurring with less frequency.
   (c) Flexed and semiflexed position relatively important in that order.
   (d) Grave goods rare to absent. (See "Mortuary customs" under: Significant variations.)

(e) Grave goods include chipped-stone artifacts, bone and antler implements, ground stone artifacts, animal teeth or entire bone elements, and incomplete pottery vessels, relatively important in that order.
(f) Grave pit contours characteristically rounded.

4. Trade: relatively rare presence of non-regional materials.
5. Stone chipping technique:
   (a) Percussion finish generally predominating over pressure finish.
   (b) Products characteristically coarse and heavy. (Additional, fine products rare and of local importance.)
6. Chipped stone artifacts most widely representative:
   (a) Projectile point types *a*, *b*, *d*, *e*, *g*, *f*, and *c* (see Fig. 39, I), relatively important in that order.
   (b) Chipped knife types *d*, *a*, and *c* (see Fig. 39, II), relatively important in that order.
   (c) Retouched spall type of flake knife.
   (d) Drill types *a* and *b* (see Fig. 39, III).
   (e) End-scraper types *a*, *b*, and *c* (see Fig. 39, IV).
   (f) Heavy generalized side-scraper; "scraper-knife;" "crude knife."
7. Abraded stone technique:
   (a) Pecking, grinding, and polishing.
   (b) Rough percussion chipping as a primary treatment widely present.
8. Abraded artifacts:
   (a) Three-quarter and fully grooved axes.
   (b) Petaloid (tapering from bit of pointed poll) axes, present to rare.
9. Rough stone implements:
   (a) Abrader, unspecialized.
   (b) Pitted and battered pebble hammers.
10. Bone splinter and ulna perforators.
11. Unmodified antler tip stone flaker.
12. Pottery
   (a) Paddle-and-anvil (including hand as anvil) method of shaping and surfacing. (See "Coiling" under: Significant variations.)
   (b) Paste with granular temper, characteristically breaking along irregular lines with rough edges.
   (c) Surface plain, with corded-paddle application to exterior, or semi-smoothed after primary application of corded paddle.
   (d) Decorative technique: punctating (small exterior indenting), imprinting with cord-wrapped implements, imprinting with single cords, sharp incising, and rounded incising.
   (e) Areas decorated include inner and outer rims and lip.
   (f) Types of design:
      (1) Simple geometric treatment, characteristically in straight lines, to form band motifs.
      (2) Repetition of independent motifs to dominate decorated area.
   (g) Simple shape variety, characteristically limited to wide-mouthed pots, commonly with vertically elongated bodies with conoidal or rounded bases, with or without well defined shoulders.
   (h) Rim shapes most commonly from vertical to flaring, terminating simply or with either thick outer-lip margins or, more rarely, with collar-like outer folds.

Significant Variations

In a number of instances certain traits were found to be very strong in Woodland manifestations over an important part of the area, but entirely absent in other parts. These could not be included in the list of pattern traits, but they promise to be significant in any study tending toward classificatory sub-division of the pattern. However, we do not recommend that subdivision be proposed and defined on a basis of these traits alone. The following incomplete list presents a few of the outstanding traits so distributed.

1. Community life:
   (a) Agriculture appears to be relatively important in eastern, present in certain middle and late western, and unknown for early middle, early western and some late western manifestations.
   (b) A phenomenon locally termed "fire beds" appears to occur only in New York and New England.
2. Mortuary customs:
   (a) Disposal in earthen mounds is common everywhere excepting in New York and New England, although mounds are not reported from certain areas not considered at the Conference, including Ontario and eastern Canada, eastern Pennsylvania, New Jersey, and Delaware. (They are reported as associated with Woodland manifestations in the Southeast.)
   (b) The presence of parts of pottery vessels associated with burials, common elsewhere in the area, is not known for New York and New England.
   (c) Grave furnishings apparently more common and abundant in instances in New York and New England than elsewhere in the area.
3. Rough stone implements:
   (a) Multiple-pitted stones most common in New York and New England, unknown west of Illinois.
   (b) Pebbles with opposed notches (sinkers?) have a scattered occurrence over a wide area, but are most common in New York and New England.
4. Bone and antler:
   (a) Socketed bone projectile points, not common anywhere in the area, have principal occurrence in New England and New York.
   (b) Flat mat- or snowshoe-sewing needles present in Wisconsin but common only in New York and New England.
   (c) Eyed, cylindrical needles present only in New York and New England.
   (d) Dressed antler, stone flakers present only from Indiana eastward.
   (e) Bone fishhooks present only in New York and New England.
   (f) Bilaterally barbed, imperforate bone points present only in New York and New England.
5. Pottery:
   (a) The coiling or coursing method, which in no way conflicts with paddle-and-anvil shaping, is known for all areas involved in this report excepting Ohio, Minnesota, and Nebraska.
   (b) Fabric-marked interior present only in New York and New England.
   (c) Plain plaited marks on exterior present only in Ohio, New York and New England.
   (d) Stamped-paddled exterior present only in New York and New England.
   (e) True collars rare outside of New York and New England, not present west of Illinois.

Uncertain Traits

A series of culture-indicative artifact types were found to have a wide distribution in the area highly suggestive of Woodland association, and to actually occur as Woodland

products in certain instances, but can not at present be definitely identified as of Woodland origin throughout the area of their distribution. Some or all of these in time may be demonstrated as significant pattern markers. Prominent in this list are: "plummet" stones, "boat-stones," "bar-amulets," "bird-stones," "gorgets," and certain varieties of "banner-stones."

Conclusions

We believe that this conference has demonstrated in general certain advantages inherent in such meetings, and specifically the practical value of the methods employed toward determining the actual category of known facts in support of a taxonomic grouping of cultural manifestations. Conflicts of long standing, based primarily upon misunderstandings, may be replaced by complete accord when the students involved are given the opportunity to meet across the table and to compare facts and ideas at first hand. If the procedure at such a conference is limited to a listing of known cultural facts in relation to their occurrence in space, and the results of this procedure are so clearly indicative of an important, basic similarity in the manifestations subjected to analysis that the delegates unanimously accept the demonstration as conclusive, and agree on the list of data segregated in support of that conclusion, the conference may be said to have accomplished its primary purpose, and its methods are justified by their success.

Twelve men, with the active assistance of four delegates who could not be present at the Conference, representing in all fifteen states, have collaborated and agreed upon the tentative Woodland pattern trait list presented in this report. They feel that they have demonstrated that the concept of a Woodland pattern is justified by facts as a useful, practical association of culturally related manifestations. They submit the result of their work as an initial answer to the demand for a detailed, definitive analysis of Woodland. They propose that further interpretations of Woodland-like phenomena, wherever encountered, be made on a primary basis of comparison with this initial analysis of the pattern. Finally, they suggest that similar methods might be employed profitably toward the definition of other much-used taxonomic terms, such as "Mississippi" and "Hopewellian."

Future conferences should be organized to consider Woodland varieties outside the area represented at this meeting. More local problems, involving subdivisions of Woodland, can be attacked by more limited groups comprising local students.

Terminology as Used in This Report

(The authors, rather than the Conference delegation as a whole, are responsible for these definitions to which they subscribe in substance with some individual reservations as to statement.)

Collar (*of a pottery rim*). A protruding rim band about the outer neck of a vessel, of major shape importance, sharply shouldered at its lower margin, produced either through modeling or the application of a separate fillet of clay.

Conoidal. Tending toward a conical shape.

Corded paddle. A tool, presumably consisting of a paddle-shaped object closely wrapped with cord, by means of which it is believed that the cord-roughened surfacing so common on Woodland and similar pottery was produced.

End-scraper. (see "Scraper").

Flexed position. The posture of the body in a primary burial characterized by a flexure of the limbs to bring the knees to a position at less than a right angle to the trunk.

Lip (*of a pottery rim*). That portion of the rim, analogous to the human lip, which immediately surrounds the mouth of a pottery vessel, and marks the juncture of the inner and outer wall surfaces.

Motif. The design, either element or unit, which is strongest in a decorative pattern and forms the base thereof.

Multiple burial. Disposal of more than one individual, or representative parts thereof, in a grave.

Nomadic. Wandering with no fixed villages or camping places, excepting as temporary natural conditions, relating to water or food sources, may dictate for a limited time. Examples: the horse-riding Indian of the Plains, Central Eskimo.

Paddle-and-anvil. Method for shaping and surfacing pottery by which some "tool," such as a smooth stone, or even one of the potter's hands, is placed as a support against the inner wall of the vessel under construction while the directly opposed outer surface is spanked with a paddle, serving to weld together the newly applied with preceding elements of clay, finish the outer surface, and generally to thin and expand the wall.

Paste. The clay as prepared for shaping into a pottery vessel or object.

Permanent house. House built and intended to serve as a permanent abode, with fixed parts which are only replaceable as they deteriorate.
Example: earth lodge of Mandan, pueblo of Hopi, plank house of Haida, wattle-and-clay house of Middle Mississippi manifestations.

Primary burial. Original disposal of human remains, in the flesh.

Projectile point. Any pointed object, whether of stone, bone, antler, or other material, which may be logically presumed to have been intended for use as the penetrating point on a thrown or otherwise propelled missile; as arrow point or spear point.

Punctate. A term relating to the small, surface indenting present as a decorative element on some pottery.

Retouch-spall type of knife. A thin flake of flint, or a similar material, one edge of which has been lightly retouched by means of pressure flaking to produce a cutting or scraping edge.

Rim. That portion of the walls of a pottery vessel which is marginal and has a shape relation to the orifice or mouth.

Scraper. An implement the edges of which are retouched by artificial flaking, characteristically at an angle approaching a right angle to the plane of one flat side. The inferred use of these tools is similar to that of a plane. Scrapers may be made of spalls or broken implements; they may be wholly surfaced by secondary flaking, or not at all.

(a) End-scraper:
Retouched edge is characteristically at right angles to the axis of the tool.

(b) Side-scraper:
Retouched edge is characteristically parallel to the axis of the tool.

Secondary burial. Redisposal of human remains after an earlier or temporary disposal; consisting of bundled, disarticulated, or rearticulated bones.

Sedentary. Movements limited by life in fixed villages normally occupied by succeeding generations; may or may not be conditioned by agricultural economy.
Examples: Natchez, Hopi, Haida.

Semi-flexed position. The posture of the body in a primary burial characterized by any flexure of the limbs which brings the knees to a position at a right or greater angle to the trunk.

Semi-permanent house. House with permanent frame intended to remain in original location, covered with impermanent materials which are easily removed and frequently replaced.
Examples: Iroquois long house, Menomini summer lodge.

Semi-Sedentary (*or semi-nomadic*). Temporary wandering within a prescribed area of occupation, with seasonal or frequent returning to rather permanent villages or long-established camping places; seasonal gardening or food gathering may supply the primary inducement to return to former sites of occupation.
Examples: Pennacook, Menomini.

Shoulder (*of pottery vessel*). The horizontal line of maximum circumference in instances where this line is nearer to the top of the body than to the base. (Shoulder area: the area or zone at the shoulder as defined above.)

Single burial. Disposal of one individual, or representative parts thereof, in a grave.

Temper. A substance such as sand, crushed or granulated rock, slacked and crushed shells, etc., added to clay, in the process of preparing the paste for pottery. (Also called "aplastic.")

Temporary house. A house erected with no thought or purpose of permanency, which may be either abandoned or conveniently dismantled and moved to a new location at will without material loss to the owners.
Examples: Bark or mat wigwam, skin tipi, snow igloo.

BOOK REVIEWS

A Report on an Investigation of the Brandon Village Site and the Split Rock Creek Mounds. W. H. Over and E. E. Meleen. Archaeological Studies. Circ. No. 3. University of South Dakota Museum, Vermillion, South Dakota. 1941 (mimeogr.).

This paper is concerned with excavations at two sites in the valley of Big Sioux River, in southeastern South Dakota. The locality lies between the Eastern Woodlands and the Plains, and promises to be of considerable importance in studies of the pre-contact horticultural groups of the upper Missouri drainage.

The Brandon village site, where six of thirty-seven house pits were opened, occupies an area of about three acres on a steep-sided, partially ditched, promontory. Semi-subterranean rectangular earth lodges of somewhat unusual type are indicated; central postholes and entrance passages are said to be missing, and wall posts occur only on the two longer sides. Direct evidence of horticulture was not found, though its practice may, I think, be inferred. There are similarities to the Nebraska culture remains down the Missouri, but the authors conclude that Brandon, together with the previously described Mitchell and Twelve-Mile Creek sites, are most closely related to the Mill Creek culture of northwest Iowa. For the three South Dakota sites, where strong Middle Mississippi influences are apparent, they suggest the term Over focus of the Mill Creek (aspect ?).

The paper closes with a paragraph credited to Griffin wherein culture development in the middle Missouri valley is briefly outlined. This, I presume, is largely speculative, but it would be interesting to know what Nebraska culture sites Griffin regards as early, i.e., as flourishing at a time when Mill Creek, but not the Nebraska and Upper Republican aspects, was receiving Middle Mississippi influences.

The Split Rock Creek mounds, about a mile or less east of the Brandon village site, were briefly examined in 1921 by Myer for the Bureau of American Ethnology. Both Myer and the Over-Meleen party found primary, secondary, and cremated burials in pits below the mound base. Artifacts were not plentiful; they included a few shell beads and other ornaments, a bone hairpin, bone flesher, ochre, and potsherds. Relationships with Wilford's Red River Woodland aspect in Minnesota are suggested.

Six crania found by Over and Meleen at Split Rock have been sent for study to the U. S. National Museum, which has a somewhat larger series collected by Myer. Preliminary observation suggests that they are long and low-vaulted. Additional studies are needed before their relation to Omaha and Ponca crania can be established. There remains, then, the problem of correlating these materials with a Woodland culture operating in southeastern South Dakota at a time when horses were known and the local Dhegihan tribes were supposedly in contact with white traders.

Waldo R. Wedel
U. S. National Museum

The Schrader, Champe, and Fremont I, sites. A. T. Hill and Paul Cooper. (Nebraska Historical Magazine, Vol. 17, No. 4, 1937).

The Archaeological Campaign of 1937. A. T. Hill and Paul Cooper. (Nebraska Historical Magazine, Vol. 18, No. 4, 1938).

Report of Explorations, 1938. Paul Cooper. (Nebraska Historical Magazine, Vol. 20, No. 2, 1940).

Woodland-like Manifestations in Nebraska. A. T. Hill and Marvin Kivett. (Nebraska Historical Magazine, Vol. 21, No. 3, 1941).

A Site of the Dismal River Aspect in Chase County, Nebraska. A. T. Hill and George Metcalf. (Nebraska Historical Magazine, Vol. 22, No. 2, 1942).

This series of field reports, prepared by various authors and issued at intervals over a period of 5 years, presents some of the more noteworthy results of work by the archaeological survey of the Nebraska State Historical Society. Although written in part for non-professionals, the papers as a group make available to archaeologists a considerable body of carefully gathered data from eastern, central, and southwestern Nebraska. Several of the reports supply additional information on archaeological horizons already known in some detail from the publications of the Smithsonian Institution and the University of Nebraska; others outline for the first time culture complexes of which little was previously on record beyond the bare fact that they existed.

The first three papers deal chiefly with reconnaissance excavations along the Missouri River, and elsewhere, in eastern Nebraska, at sites assignable to the prehistoric Nebraska culture. In order to determine more accurately the geographic extent and variations of this complex, and also to salvage additional samples of pottery and other remains from sites fast disappearing before the plow and relic-collector, nearly 50 house units at some 30 village sites were opened, together with numerous cache pits, burial mounds, and non-mound cemeteries. These investigations, supplementing earlier work in the area, confirm (1) the intensive occupancy of the Missouri valley bluffs zone by semisedentary Nebraska culture peoples, (2) the relative homogeneity of the remains in nearly all details except ceramics, and (3) the widespread occurrence of Woodland materials, in all probability earlier, in the same area. Instructive is the additional information on the extent of Middle Mississippi ceramic and other influences, and on the fusion of westerly Nebraska culture remains with the contemporary Upper Republican.

Like others before them, Hill and Cooper have encountered a vexing problem in the effort to allocate burials along the Missouri River to a specific cultural horizon. For the most part, burials in this area are unaccompanied by diagnostic artifacts, and since earlier and later peoples clearly lived and buried in the same localities, the burial customs and physical relationships of the Nebraska culture peoples are still anyone's guess. Some of the skulls found in 1938 at site Do4b, in northeast Douglas County, have been briefly examined at the National Museum. Pronounced occipital deformation occurred in several instances, and mesocephaly or brachycephaly appears to be the rule. I am inclined to believe these represent the, or a, Nebraska culture type though Cooper is properly circumspect in his handling of the cultural evidence. We may expect that future careful studies of all crania now on hand from this section of the Missouri River bluffs will show several divergent physical types, as Poynter's more limited studies indicated nearly 30 years ago. Additional information of this character, even though we might have to wait a few years for its correlation with cultural horizons, would be a contribution of major importance to eastern Plains prehistory.

In the reviewer's opinion, the distributional data here placed on record justify the survey methods used. At the same time, I agree with those who contend that the main outlines of Nebraska archaeology are now clear enough so that in future work the emphasis ought to be shifted from a sampling of many scattered sites to the more or less complete excavation of certain key sites whose location should be apparent by this time. It is primarily through the thorough analysis and comparison of strategically located and adequately inventoried sites that the temporal and developmental sequence of Nebraska culture variants will ultimately be made intelligible. This viewpoint the authors of the papers in question recognize and advocate; I strongly doubt that they themselves view the reports as more than a preliminary statement. The specialist will look forward to a more penetrating statistical analysis, particularly for sites such as Do2, where 10 excavated house pits should give a reasonably inclusive picture of the village complex, and for T2, where 6 houses were investigated.

A timely contribution is the report on Woodland remains by Hill and Kivett. The first portion is devoted to a description of excavations at a village site in Valley County, in central Nebraska. Pottery shows most of the characteristics which have come to be regarded as typical of Plains Woodland sherds. Whether the authors' identification of the "features" as house sites will be accepted remains to be seen, but for the larger examples, with fireplaces, this seems a plausible suggestion. The absence of polished stone work is a little surprising. The artifact inventory as a whole shows several dissimilarities to Upper Republican and other previously defined Plains horizons, though there are general re-resemblances in such ubiquitous items as snubnose scrapers, tubular beads, etc. Interesting is the discovery of notched bone fleshers, previously reported only for protohistoric and historic Plains horizons. This recalls Jenks' report of a basically similar tool from the Arvilla gravel pit, also involving a Woodland complex. The authors found no signs of maize cultivation at Vy 1 (subsequent investigations at other Nebraska Woodland sites yielded charred maize in two instances), or of unquestionably associated burials.

The second part of the report enumerates additional Woodland sites, identifications being based chiefly on surface sherd collections. The data, though admittedly incomplete, show that Woodland remains extend well into the High Plains; that they probably precede all other known pottery horizons in the trans-Missouri plains; that at least two, and possibly more, variants exist; that the Sterns Creek type is virtually confined to the Missouri valley whereas the Vy 1 (Valley County) variant is the more abundant type farther west. At least one buried site near Peru shows both Woodland and Hopewellian sherds, though here secondary deposition may have distorted the picture. Through no fault of the authors, many of the illustrations in this report are so badly reproduced as to be of little or no help to the reader. This is particularly regrettable because virtually no usable illustrations of Nebraska Woodland vessels and artifacts have been previously published.

The paper by Hill and Metcalf will be of interest not only to archaeologists and general readers but also to students of early historic Indian-white contacts in the western High Plains. Here for the first time we have a detailed well-written report on a Dismal River culture village site, representing a widely distributed horizon briefly noted by Strong but only recently subjected to serious investigation. The Lovitt site in Chase County furnished evidence of both horticulture and hunting, of semi-permanent houses, of a distinctive pottery tradition, etc. There were no horse remains, but iron and perhaps copper are evidence of contact with white men. Much of the archaeological inventory is that of the historic Plains tribes; there is a definite suggestion of Southwestern contacts; and the authors see possible Woodland influence in vessel forms. Whether the remains are Apache, Comanche, or something else, the present report brings into sharper focus the protohistoric ethnographic situation in what was, historically, primarily a bison-hunting area. It gives substance to the shadowy figures of Indian groups, half farmers and half hunters, with which 17th and 18th century Spanish accounts people the Plains region northeastward from New Mexico. I regard as most intriguing the prospects to be realized in future when the results of further intensive protohistoric archaeology in the High Plains will have been evaluated in light of such early documentary studies as Thomas' *After Coronado*.

This report is noteworthy for other reasons. In the first place, charcoal specimens from the Lovitt site, and others from a closely related site in nearby Dundy County, have been tentatively dated at 1706 and 1709, respectively. From what is on record concerning the 18th century occupancy of the High Plains, these dates are of an acceptable order. Until the material on which they rest has been independently studied and verified, however, the dates must be viewed as suggestive rather than as conclusive. In any event,

they cannot be far off; the time period indicated for the Dismal River culture can hardly be any earlier, or much later, than that represented farther east by the Lower Loup focus (Pawnee), the Oneota aspect (Siouan), and to the south by the "Quiviran" (Wichita ?) remains of central Kansas. The time may not be far distant when all these entities can be allocated with reasonable certainty to historic tribal groups, on the one hand; and on the other hand, be related to earlier manifestations on a strictly prehistoric level.

The descriptions and discussions in all these papers are supplemented with maps, text figures, and half-tones, most of them adequate for comparative purposes. It is perhaps superfluous to add that the reports by no means exhaust the wealth of archaeological information gathered by Mr. Hill and his associates in the past decade, both with and without WPA assistance. The collections so made will provide important scientific source material for many years to come; they cannot be ignored by anyone seriously interested in the interpretation of Plains prehistory.

WALDO R. WEDEL
U. S. National Museum

Indian Stone Enclosures of Colorado and New Mexico. E. B. RENAUD. (Anthropological Papers, No. 2, University of Denver, Jan. 1942.)

Indian Stone Enclosures of Colorado and New Mexico, by Dr. Renaud, is a discussion of a specialized type of masonry structure which he has examined in the Arkansas River drainage and immediately adjacent areas. Essentially, these consist of circles of piled stone or dry-laid masonry, usually built on hills, and ranging in elaboration from single rings to groups of rings within stone-walled enclosures. The type had been recognized in the Texas Panhandle by Moorehead in 1921, followed by more complete notes and illustrations in 1931, at which time several Colorado sites were described. Dr. Renaud's subsequent surveys (Renaud, 1931, 1932, 1935) covered areas to the northwest of the Panhandle area in the headwaters of the Arkansas River drainage. In the present report Renaud (1942) abstracts and summarizes the more important of his earlier descriptions, including some examples reclassified from another heading (tipi rings), and adds a number of new sites from the Walsenburg (Colorado) area and from eastern New Mexico. Among these are listed additional instances of a masonry-walled compound site.

Renaud attempts no review of the literature referring to the dry masonry sites. These have been noted in Colorado by many writers from Escalante's time on, usually identified as "forts" of the recent Utes (e.g.: Escalante, in Harris, 1909; Ruffner, 1874; Endlich and Rhoda, 1876, 1877; Sanford, 1924). Recent interest in Southern Athapaskan archaeology has stimulated research on this type of ruin, and in addition to the above, comparable occurrences may be cited from the Pueblo Southwest and beyond in almost every direction (e.g.: Arizona Papaguería: Tanner, 1935; Sauer, Brand, 1931; Hoover, 1941; former Mescalero Apache range: Mesa, 1938; former Navaho range: Colton, 1920, Kidder and Nelson, 1924; Utah: Judd, 1924, Reagan, 1933, Gillin, 1938; California: Steward, 1938; Washington: Smith, H. I., 1910; Wyoming: Comstock, 1875).

Part I of "Indian Stone Enclosures" consists of a site list, with exact locations given, and individual structures described in greater or less detail, measurements given in some instances indicate a range in diameters of .8 to 6 meters for individual structures excluding the circumjacent walls. Since the department has attempted no excavation program, the material culture is described only from scanty surface collections. Renaud's treatment of pottery associations, certainly one of the most important aspects of such investigation, is at once brief and confusing. Thus, though " . . . pottery . . . (is) lacking at my sites in the east . . . ," and " . . . pottery is virtually missing . . . (at the) enclosures of southeastern Colorado," we find "thick pottery," a "course looking potsherd," a "potsherd of

Apache clay," "two sherds of Plains pottery," "six sherds of Plains pottery, of which two are grooved, two incised and two finger rubbed; thirteen painted fragments supposed to be four Chaco II, and nine Santa Fé Black-on-white," and "The potsherds comprised six pieces probably of Pueblo plain type and thirteen considered as being Chupadero Black-on-white." These latter occurrences (in eastern New Mexico) agree essentially with Moorehead's findings from the same area. In addition Moorehead (1931) has obtained pottery cross dates (Pueblo Black-on-white) of ca. 1100 A.D. for a site near Canyon City, Colorado; and Pearsall (1939) reported pottery cross dates (Bandelier Black-on-grey, Cundivo indented) of ca. 1450 A.D. for closely comparable sites in the San Luis Valley of southern Colorado.

Part II is devoted to short discussions of the characteristics, purposes, and origin of the masonry circles. In his conclusions, Dr. Renaud states, " . . . we have no clear cut and convincing conclusion to present as to the purposes of our stone enclosures, only more or less acceptable suggestions concerning the destination of some of the sites": these "acceptable suggestions" are that the stone rings may have been "observation posts from which visual signals could be transmitted," "stone defenses," and "ceremonial sites" of a "solar cult." He discredits their use as dwellings, attributing the fireplaces, showing on the surface in some of his sites, to "fire signals to transmit a message." As to origin he concludes that they do not belong to the "Culture Complex of the Plains" nor to the "Pueblo Culture Complex" but to "a third element, foreign to both cultures," and that the distributional mapping of more such sites "might substantiate the belief that they are the product of a southern intrusion."

Renaud's paper would have been strengthened by consideration of the abundant historical documentation of the area discussed and of the type of ruin described. The report will be found valuable for the new sites listed, which help to fill an important gap in the known distribution of the dry masonry rings.

BETTY HOLMES HUSCHER
Colorado Museum of Natural History
Denver, Colorado

Irene Mound Site, Chatham County, Georgia. JOSEPH CALDWELL and CATHERINE MCCANN, with a section on *Physical Anthropology* by FREDERICK S. HULSE. (University of Georgia Press, Athens, 1941.)

The Irene report is a pleasant surprise, especially so when one considers the difficulties under which the research was undertaken. Dr. A. R. Kelly, in his foreword to this report, mentions some of these difficulties. In the first place C. B. Moore undertook extensive excavations of a part of the site in 1897. The county engineers had removed an important part of Irene to provide fill for a nearby creek bed. Other complicating factors were the cellar of the old Moravian school on the main mound summit, a Colonial cemetery, a semi-tropic forest cover, tidal erosion from the Savannah River, and the fact that four successive archaeologists were in charge of the project. Only hinted at by Kelly were the multitudinous problems of administering WPA archaeology and attempting research activities at the same time. It is the reviewer's experience that southeastern archaeological investigations were undertaken both with the assistance of WPA and in spite of WPA. These ambivalent factors presented difficulties almost as great as the hindrances already mentioned, despite the fact that only WPA assistance made such extensive research possible. In passing, it should be mentioned that Kelly's foreword contains the only published description of the archaeologists' immigration into the Southeast.

The format of this book is rather unusual and aesthetically pleasing. The report has a burnt-orange paper cover which is decorated with an all over pattern of filfot crosses

as found on the pottery type, *Irene Filfot Stamped*. The text, in easily readable type, is arranged in double columns. Typographical errors are at a minimum. The position of the notes at the end of each chapter produces a slight inconvenience for the lazy reader. The numerous figures and plates are clear, concise, plainly captioned, and well integrated with the text.

The Irene mound was the largest in the Savannah region and also had the longest cultural continuum thus far known for the area. The major part of the site was constructed in the Irene and Savannah periods. There were, however, minor occupations of this site in the St. Simons, Deptford, and Wilmington periods which antedated the mound building at Irene. These periods are based upon the ceramic chronology which in turn is based upon pottery typology and stratigraphy. As correlated by the authors with the Ford and Willey system, the Irene and Savannah periods would belong to either or both of the Temple Mound I and II stages. The St. Simons period would belong to the Archaic stage, the Deptford period is late Archaic, and the Wilmington period belongs to the Burial Mound I stage.

The Irene period is protohistoric. The authors guess that Irene was occupied for a considerable time after 1492 and probably almost until 1600. Although there was no evidence of historic contact at the site, Irene-like pottery was found associated with contact material at another site farther south. Perhaps, as the authors suggest, the inhabitants of Irene were the Guale (Yamassee) or Cusabo who probably spoke a Muskhogean language.

The Irene site was extremely complex. The main mound consisted of eight mounds, one superimposed over the other. Other important parts of the site were the burial mound, the mortuary, the rotunda, and a number of inclosures, palisades, and buildings. The first seven mantles of the main mound were pentagonally shaped with ascending ramps. The first four of these pentagonal mounds had depressed summits, the remaining three were flat. Probably all seven of these mounds had structures on their summits, although in one instance it could not be demonstrated. The ground plan of the summit structures was basically rectangular. The last mound erected over the previous seven mantles was circular and round-topped.

The archaeological complexities of the Irene site have been interpreted and neatly synthesized in the report. The many structures of the site are all described and correlated in a chronological sequence. Also the material culture of Irene is described and correlated with structures and periods. Although there are some parts of the report which the reviewer would have presented differently, there is no objective basis for criticism. In general it is an excellent report and even exceptional when one considers the complicated nature of the site and the many difficulties which were successfully overcome.

There is a section on physical anthropology by Frederick S. Hulse. This part of the report has not been included in the review, because it is the reviewer's impression that a physical anthropologist should review this section.

GEORGE I. QUIMBY, JR.
Muskegon County Museum
Muskegon, Michigan

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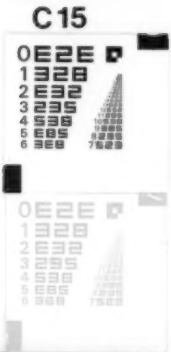
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